SOVIET GEOGRAPHY:

REVIEW & TRANSLATION

DECEMBER 1960

Published by
AMERICAN GEOGRAPHICAL SOCIETY
Broadway at 156th Street, New York 32, N.Y.

Vol. I No. 10 December 1960

Soviet Geography: Review and Translation

THEODORE SHABAD, *Editor*

LAWRENCE ECKER, *Translator*

Advisory Committee

THEODORE SHABAD, *Chairman* CHARLES B. HITCHCOCK, *Consultant*

GEORGE B. CRESSEY
EDWARD B. ESPENSHADE, JR.
CHAUNCY D. HARRIS
DAVID J. M. HOOSON
W. A. DOUGLAS JACKSON
HUEY LOUIS KOSTANICK
PAUL E. LYDOLPH
ALOYS A. MICHEL
JOHN A. MORRISON
ALLAN L. RODGERS
ROBERT N. TAAFFE
JACK R. VILLMOW

Soviet Geography is published by the American Geographical Society to make available in English reports of current Soviet research in geography. Most of the reports are translated from *Izvestiya Akademii Nauk SSR, Seriya Geograficheskaya*, the journal of the Institute of Geography of the Academy of Sciences of the USSR; *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*, the journal of the Geographical Society of the USSR, and *Voprosy Geografii*, a serial publication of the Moscow branch of the Geographical Society of the USSR. In addition to translations of geographic articles, *Soviet Geography* will contain news notes on Soviet political and economic developments of interest to geographers, and a survey of Soviet geographic literature.

This translation and publication project was undertaken by the American Geographical Society in the conviction that the dissemination of the fruits of Soviet geographic research would be a service to American geographers and would help bring about professional contacts between geographers of the two countries. The National Science Foundation encouraged the project and is supporting it by a grant.

Readers are invited to send in their comments and discussion of articles published in *Soviet Geography*. Readers are also encouraged to submit suggestions as to published Soviet geographic literature worthy of translation. Such suggestions should relate to articles of general substantive or methodological interest rather than materials of narrow, specialized appeal.

The subscription rate for *Soviet Geography* is $6 a year. The price of a single copy is $1. Address all editorial and subscription inquiries to: *Soviet Geography*, American Geographical Society, Broadway at 156th Street, New York 32, New York.

Published monthly (except July and August) at the Lane Press, 305 St. Paul Street, Burlington, Vermont, by the

AMERICAN GEOGRAPHICAL SOCIETY

Editorial and General Offices: Broadway at 156th St., New York 32, N.Y.

Price $1.00 a number $6.00 a year

Second-class postage paid at Burlington, Vermont

SOVIET GEOGRAPHY: Review and Translation

Vol. I, No. 10 December 1960

Contents Page

Third Congress of the Geographical Society of the USSR

Physical Regionalization Symposium (end)

Farming Problems in the Zones of the USSR and the Tasks of Soviet Geographers -- V. P. Sotnikov 3

Experience in Distinguishing Agricultural Zones and Regions on the Agricultural Map of the USSR -- M. I. Nikishov 23

The Physical-Geographic Regionalization of the Ukrainian SSR for Agricultural Purposes -- A. I. Lan'ko, A. M. Marinich, V. P. Popov, O. V. Poryvkina and P. N. Tsys' 33

Natural-Resource Symposium (end)

Questions of the Geographical Study and the Economic Use of Forests -- P. V. Vasil'yev 50

The Reserves of Wild Game; the Dynamics of Hunting and its Prospects -- S. V. Kirikov and Yu. A. Isakov 64

News Notes -- Theodore Shabad 90

Current Literature 94

TRANSLITERATION TABLE

Russian			English	Russian			English
А	а	*а*	a	Р	р	*р*	r
Б	б	*б*	b	С	с	*с*	s
В	в	*в*	v	Т	т	*т*	t
Г	г	*г*	g	У	у	*у*	u
Д	д	*д*	d	Ф	ф	*ф*	f
Е	е	*е*	e*	Х	х	*х*	kh
Ж	ж	*ж*	zh	Ц	ц	*ц*	ts
З	з	*з*	z	Ч	ч	*ч*	ch
И	и	*и*	i	Ш	ш	*ш*	sh
Й	й	*й*	y	Щ	щ	*щ*	shch
К	к	*к*	k	Ъ	ъ	*ъ*	"
Л	л	*л*	l	Ы	ы	*ы*	y
М	м	*м*	m	Ь	ь	*ь*	'
Н	н	*н*	n	Э	э	*э*	e
О	о	*о*	o	Ю	ю	*ю*	yu
П	п	*п*	p	Я	я	*я*	ya

(*) Instead of e, use ye at the beginning of names, after vowels and after the soft sign (').

The transliteration table is supplied for the general information of readers and to enable them to identify the geographic names on maps that will be reproduced from time to time in **SOVIET GEOGRAPHY.**

The transliteration system is the one proposed by the United States Board on Geographic Names. For more general use in textbooks and other popular needs, the following simplifications are recommended by the editor of SOVIET GEOGRAPHY:

1. Eliminate the use of (') and (").
2. Use i for iy, and y for yy.
3. Convert diphthongs ay, ey, oy, uy to ai, ei, oi, ui.

THE THIRD CONGRESS OF THE GEOGRAPHICAL SOCIETY OF THE USSR

FARMING PROBLEMS IN THE ZONES OF THE USSR AND THE TASKS OF SOVIET GEOGRAPHERS

By V. P. Sotnikov

Agriculture in general and particularly crop raising in the broad sense are largely dependent on natural factors- climate and weather, the hydrologic regime, soil cover and relief, and often also the geologic structure of the given area. As productive forces, science and technology develop, new ways and methods are found for overcoming the natural factors restricting human activity, for actively influencing nature and transforming it in the interests of man. The degree of activity and depth of the effect on nature largely depend on social causes, which either shackle man's transforming activity or give it full scope.

We know that capitalistic production relationships retard the realization of scientific methods of transforming nature for the purpose of stimulating the productive forces and developing agriculture. The new production relationships in Socialist countries, on the contrary, contribute to the efficient utilization of natural resources for the stimulation of agriculture. The development of agriculture in turn leads to a change in "pristine nature" and the creation of the cultural landscape.

The republics of Soviet Central Asia may serve as an example. Agriculture there was for many centuries in the grip of the desert belt. But in slightly more than forty years intensive farming has been instituted here; large areas have been won from the desert. The Soviet Union now holds first place in the world in cotton production. And this is only the first stage. Before us open even grander prospects of transforming the desert into flourishing cotton plantations, orchards and vineyards.

In Kazakhstan, Western Siberia and the Trans-Volga Region vast regions used to be marked on botanical maps as steppes of the drought-ridden and semi-desert zones. It contained many species of feathergrass, fescue grass, tonkonogi (Poa bulbosa) and wheatgrass. Bustards, strepeta (Microtis tetrax) dzheyran gazelles and kozuli (Capreolus) ranged freely over the steppe. In the lakes and reeds nested wild ducks and geese. By the will of the party and the Soviet people the nature of these steppes has now been radically changed. Instead of feathergrass and fescue grass there are fields of wheat; instead of dzheyran gazelles, flocks of cattle and sheep; instead of wild geese, large poultry farms. There are many such examples. Irrigation and drainage systems are being built, deserts and swamps are being converted into fields and pastures. The geography of large areas is being changed, older maps are becoming obsolete, and in many regions geography texts no longer correspond to reality.

There is no need here to recite again the tasks set by the party in the field of agriculture for the current seven-year period. Suffice it to say that by 1965 the production of grain per capita is to be increased to 720-790 kg., meat to 87-92 kg. and milk to 435-460 kg.

The solution of this task involves directly the work of geographers. They can and must make their contribution to the discovery of new reserves and opportunities for the more rapid development of agriculture.

In this connection it is fitting to touch upon, and discuss at least briefly, the country's major farming problems by natural-economic zones.

The fundamental farming problem for all regions is the raising of the crop yield of all agricultural crops and, above all, the increasing of the production of grain, the basis of all agricultural production.

Naturally, farming and animal raising by any one single scheme over the whole vast territory of the USSR are unthinkable. Agriculture can attain the highest productivity only in strict accord with the objective natural and economic factors of a given area.

Proceeding from this fact, the 20th party congress in 1956 set the task of working out, on the basis of data accumulated by science and practical experience, a scientific system of agricultural management with reference to the local conditions of natural-economic zones, regions and individual farms. This task had to be solved to determine the correct specialization of production, the structure and relationship of its branches, and to draft a system of agrotechnical, zootechnical, organizational and other measures that would make it possible to attain, under the given conditions, the highest level of production per 100 hectares of agricultural land with the least expenditure of labor and funds. In the resolutions of the June and December plenums of the party's Central Committee in 1959 and in the directives of the 21st party congress, the importance of agricultural management differentiated according to the natural conditions was again stressed.

Guided by these directives, the Ministry of Agriculture USSR, under the scientific-methodical guidance of the All-Union Academy of Agricultural Sciences named for V. I. Lenin, jointly with agricultural agencies, scientific-research institutes and experimental stations, beginning in the second half of 1956, proceeded to work out a scientific system of agricultural management with reference to the local conditions of natural-economic zones and regions.

Thirty-nine zonal commissions made up of scholars, specialists and practical workers were set up under agricultural research institutes and, in a number of regions, under the agricultural agencies. They proceeded to analyze and synthesize all the best that had been accumulated by science and practice in a given region and on this basis worked out a system of co-ordinated measures aimed at the development of farming and animal

husbandry with reference to local conditions. Over 4,000 scholars, specialists and practical workers were enlisted in the work of the zonal commissions. In a majority of the regions of the country these commissions are still continuing their work.

The whole territory of the Soviet Union was divided into a number of major zones. The latter sometimes do not coincide exactly with the boundaries of the natural zones distinguished by soil, geobotanic, climatic and other features. This is to be explained primarily by the fact that whole oblasts, krays and autonomous republics have been combined into each of the zones in accordance with economic considerations. Practical recommendations on the system of agricultural management must be related above all to the specialists and directing agencies of the respective oblasts in which the measures are to be implemented.

Each of the zones combines areas similar in their basic indices, among which special attention has been paid to soil and climate and production specialization. Account has also been taken of the common character of the main farming and animal-husbandry problems. This approach to the distinction of zones does not, of course, exclude, but presupposes a further distinction within each zone of individual subzones and regions differing more or less substantially in the principles of specialization and farm management techniques.

In the RSFSR, a system of agricultural management has been drafted for 17 zones, in the Ukraine for six, in Belorussia for three, etc. In many cases this work has been done for individual oblasts, as in the case of Kazakhstan and Uzbekistan and certain oblasts and autonomous republics in the RSFSR (Moscow, Orenburg, Novosibirsk and Ryazan' oblasts, the Tatar and Bashkir ASSR's).

Experience has shown that the working out of a system of agricultural management for separate oblasts is more effective. This makes it possible to take fuller account of the characteristics and reserves for development of the agriculture of the individual rayons and farms. But in view of the similarity of conditions of many adjacent oblasts and the fact that not every oblast possesses the opportunities for developing its own system of farm management, such systems have been worked out for groups of similar adjacent oblasts, which have then been combined into a zone. A schematic map of agricultural zones for which a system of agricultural management is being worked out is represented in Fig. 1 (Pages 16-17). The accompanying table lists the basic features of the specialization of agriculture.

It seems to us that the main aspect in the drafting of a system of agricultural management in any zone, rayon, kolkhoz or sovkhoz is the specialization of production, which should correspond to the fullest extent to local natural and economic conditions. Attempts to thrust a certain economic specialization upon production at the arbitrary will of individual administrators, without taking local conditions into account, can result only in harm to the cause.

In a report to the June plenum of the party's Central Committee in 1958 Comrade N. S. Khrushchev said: "There are quite a few instances where the local party, Soviet and agricultural agencies and managers of kolkhozes and sovkhozes are not conforming with the data provided by science and foremost practice or with the opinion of the agronomists, but are interfering with crop rotations at their own discretion and are changing the structure of the sown areas and the specialization of production."

The system of agricultural management, on the basis of established specialization, must promote stability of the economy in its long-term development. Only in that case can the system, if consistently followed in practice, yield the maximum effect. Baseless changes in specialization, techniques and technology of production would mean economic management without a system and of low efficiency.

A definite specialization of many major regions and zones has already taken shape in the Soviet Union. The cotton-growing regions of Soviet Central Asia, the tea regions of Georgia, the vineyards of Moldavia and the flax-growing rayons in the non-chernozem belt may serve as examples. In those areas there is no longer any question of the basic trend in the development of the economy. It is only a matter of improving the existing specialization.

But there are also regions where the question of specialization is still to be decided. There is often a need for changing from an earlier specialization to a new and perhaps unfamiliar one. Take, for example, Krasnodar Kray. In the past it was mainly a region of commercial winter wheat. This was formerly sensible and proper. But now, when great new grain regions have appeared in the East, the conditions of the Kuban' can be utilized more productively by replacing the grain specialization of this region by an animal-husbandry, orchard-and-vineyard and industrial-crop specialization. Animal husbandry and poultry raising are now expanding vigorously on the basis of corn as the main crop.

In view of the distinctive conditions of the eastern regions, the farming problems of that zone are also taking a different shape. Farming in the northern part of Kazakhstan and Western Siberia should specialize in the production of commercial spring wheat. The sovkhozes and kolkhozes of that region produce the cheapest grain in the country. Kazakhstan and Western Siberia also provide opportunities for the development of animal husbandry on a scale permitting the use of waste from the commercial grain, locally grown fodder grains, corn silage and other locally produced feeds. In addition to meat-and-dairy cattle and sheep raising, poultry and especially water fowl raising can be developed on a large scale, making use of the lakes in Kokchetav and North-Kazakhstan oblasts and in other regions.

A typical feature of the grain regions of Kazakhstan, Western Siberia and the Trans-Volga is, on the one hand, the presence of comparatively fertile soils and, on the other, a limited amount of precipitation, low

relative humidity and frequent droughts. The most important task of farming there is the realization of measures to insure the maximum accumulation of moisture in the soil, prevent losses to evaporation and runoff and combat weeds.

One of the most effective measures for increasing the moisture supply of fields in the drought-ridden grain regions of the East is the shift from the usual moldboard plowing to plowing with flat-cutting implements so that the stubble is not plowed under but is left standing on the surface of the field. This permits the snow to be retained on extensive areas and prevents the runoff of moisture in the spring. On the other hand, the stubble can become a rel' ble means of preventing wind erosion on light soils and on carbonate soils.

An important condition for increasing farm yields, improving the water regime, mobilizing soil fertility and combating weeds in these regions is the adoption of correct grain crop rotations with a large proportion of corn in the sowings. Corn is a fine predecessor for spring wheat, and, with careful cross-cultivation of the sowings, weeds can also be successfully combated. It should be taken into consideration that the mass distribution of malignant weeds, such as ovsyug (Avena fatua) and pyrey (Agropyron), may cause a sharp drop in the yield of spring wheat and other crops. The cultivation of soils in plowed corn fields, before sowing, and on fallow areas and the early fall plowing for grain crops are therefore of first-order importance.

A big problem for Kazakhstan, the southern areas of Western Siberia and the Trans-Volga is the development of rainhole irrigation by retaining and accumulating local runoff.

According to available data, as much as 5 million hectares can be covered by rainhole irrigation in these regions. This represents a large reserve for the intensification of farming. Rainhole-irrigation lands can produce high yields of corn, alfalfa and other feed crops and thus not only increase the production of feeds for current needs, but build up reserves in case of crop failure.

Much experience in establishing rainholes and rainhole-irrigation has already been accumulated in the Saratov Trans-Volga area and it has fully justified itself. The expenditures by kolkhozes for rainhole irrigation are paying for themselves many times over already in the first year through higher yields.

On the kolkhozes of Dergachi Rayon of Saratov Oblast (Trans-Volga) fifteen rainholes with an irrigated area of 2,000 hectares have been built in the last few years. This has permitted an expansion of corn silage and a sharp increase in the number of cattle. In the Novouzensk Rayon of the same oblast the Put' Lenina kolkhoz has built rainholes on an area of 1,080 hectares. This kolkhoz obtains high corn yields and 20 to 30 centners of hay per hectare, fully satisfying the feed requirements of a doubled number of cattle.

Another reliable and tested method of increasing the moisture supply of fields in drought-ridden regions is contour plowing. This increases the moisture supply in the soil by 200 to 300 cu. m. per hectare, reduces soil erosion and thus raises the wheat yield by 1.5 to 2.0 centners per hectare. This method should be given the widest distribution not only in the drought-ridden steppe regions, but also in the forest-steppe zone, where fields are dissected by ravines and gullies and soil erosion is widely developed.

It is often maintained that the forest-steppe regions of the country are comparatively well supplied with precipitation. That is true. Precipitation amounts to 450 to 500 mm. a year. But it should be borne in mind that because of the presence of a dense network of ravines and gullies about a third of the moisture from the annual precipitation runs off and is lost to the crops. Surface erosion and vertical erosion of the soils lower their fertility. The forest-steppe zone of the eastern part of the country thus retains little moisture for crops, only a little more than the annual precipitation in the drought-ridden regions of the southeast. Consequently, the availability of moisture for farming cannot be estimated from the annual amount of precipitation. It is greatly reduced by runoff (to say nothing of evaporation).

Therefore, the large-scale implementation of measures for regulating and, above all, reducing the runoff is one of the fundamental problems of farming, both for the steppe and for the forest-steppe regions. Farmers must not confine themselves to the practice of contour plowing. They must also undertake permanent anti-erosion measures and windbreak plantings, especially on the slopes of ravines and gullies, along the river banks and along the land-use boundaries of kolkhozes and sovkhozes. Even simple engineering works for strengthening the heads of growing ravines should not be neglected.

We have dwelt on only a few characteristic problems of steppe and forest-steppe farming that are important from our viewpoint. This, of course, does not exhaust these problems, but in a brief report it does not appear possible to touch on many others.

It should be noted that, in speaking of drought-ridden regions, one must not confine oneself to that part in which there is already more or less intensive farming. Agriculture and, above all, livestock grazing embrace huge territories of the desert and semi-desert regions, where farming has for climatic reasons thus far not been developed and still has no real prospects in the near future. These regions, however, have great significance for sheep raising and beef-cattle grazing. They include central Kazakhstan, the Caspian regions and the republics of Soviet Central Asia.

An urgent problem here is the supply of water to pastures through wide use of artesian water, both for watering cattle and for irrigation farming and, especially, for growing corn, alfalfa and other feed crops to insure emergency fodder reserves.

In Kazakhstan, Siberia and the Trans-Volga a large amount of work has already been done in developing new land. The reserves of such land are still far from exhausted. In the next few years additional millions of hectares of virgin and idle lands must be plowed there. This will require a careful study of the new areas, especially with regard to soils and climate, to avoid mistakes and to locate really fertile, unsalinified lands for tilling, as well as lands sufficiently supplied with moisture that can be counted on to yield good harvests.

No less important a problem is the study of the extensive range lands in the regions of the East. Kazakhstan alone has about 200 million hectares of such lands. They are situated principally in the semi-desert and desert regions and are marked by low productivity. But there is every reason for supposing that the productivity of range lands in Kazakhstan and other eastern regions can be considerably improved by the sowing of grasses, ecologically adapted to the arid conditions. This project also requires special climatic, soil, hydrologic and geobotanical field studies.

We have touched only upon the most important problems of farming in the eastern regions and have dealt only very briefly with them. But even so it becomes evident that there are still immense reserves here for increasing the productivity of farming. On the other hand, the utilization of these reserves makes it necessary to enlist the aid of climatologists, hydrologists, soil scientists, geobotanists, geomorphologists and other specialists for a thorough study of the possibilities and methods for increasing the productivity of the semi-desert and desert range lands.

Farming problems of equal complexity though of quite a different character are found in the non-chernozem zone of the European part of the country, extending from Perm' in the east to Brest in the west and to the Oka River and the Ukrainian Poles'ye in the south. This part of the country, in view of its large size, is of course not homogeneous in the natural and economic conditions of agricultural development. Several subzones and regions substantially differing from one another must be distinguished. Nevertheless, there are a number of common features, justifying discussion of the area as a whole as a first approximation.

As accepted in the literature, this territory belongs to the forest-meadow zone, where turf-podsol, principally acid soils poor in natural properties predominate. Precipitation is more or less considerable, at any rate sufficient, and the relative humidity is comparatively high; droughts are not typical and only now and then affect the eastern and southeastern parts of the area. The climate of the main agricultural regions is, in general, favorable to the development of intensive farming and animal husbandry.

According to the findings of the northwestern zonal commission, which is working out systems of farming for this zone (N. L. Blagovidov), the agroclimatic indices are as follows:

	Leningrad Oblast	Vologda Oblast
Degree of continentality, in terms of the range of the mean monthly temperature (in degrees)	24-26	28-30
Duration of the winter (in days)	90-120	130-160
Duration of the spring	70	38
Duration of the summer	115	118
Duration of the fall	76	47
Duration of the frost-free period	125-150	100-120
Greatest thickness of snow cover in cm.	40	50-60
Stability of the winter climate and snow cover	unstable	stable

Although the annual precipitation in this zone varies with regions, it does not fluctuate strongly and amounts to 500-650 mm.; only in the extreme eastern regions of the zone is the precipitation less than 500 mm. a year. The sum of temperatures in the main farming regions of the non-chernozem zone amounts to 1400-2000 degrees, satisfying the requirements of the main crops cultivated in this zone and sufficing for the growing of silage corn. As regards the soils, in spite of their acidity and poverty in nutrients, high yields of grains, fiber flax, potatoes, vegetables and other crops that are all stable for years -- an especially important fact -- can be obtained by liming and introducing organic and mineral fertilizers.

There is no need to discuss in detail the main properties of the turf-podsol soils of the non-chernozem zone. Let us emphasize only that in the northwestern part of the zone 50-60 per cent of the plowland is in great or medium need of liming (the oblasts adjacent to Leningrad Oblast), and in the center of the zone and farther south not less than 30-40 per cent of the tilled area requires liming. Liming is necessary to an even greater extent for hay fields and pasture lands outside the flood plains if yields are to be increased.

Turf-podsol soils contain a small supply of organic substances (humus); hence, the introduction of manure and composts, the growing of green manure and the sowing of clover in conjunction with liming are fundamental problems of farming in this zone.

The non-chernozem zone has widespread deposits of lime material (tuff and limestone) and deposits of various types of peat (upland, transitional and lowland bogs). Consequently, the sources of increased soil fertility (lime and peat) are found precisely where they are needed. Peat deposits of local significance occupy about 25,000 ha. in Kalinin Oblast, 24,000 in Gor'kiy Oblast, 22,000 in Bryansk Oblast, and about 20,000 ha. each in Moscow and Ivanovo Oblasts. In Kalinin Oblast the peat

reserves exceed 10 billion cu. m., in Moscow Oblast more than 4 billion and in Vladimir Oblast 2.5 billion cubic meters.

They represent a real reserve for raising soil fertility. However, it should be borne in mind that the application of raw peat, even from lowland bogs, without first composting it, cannot have the proper effect. The most reliable and efficient method of using peat for fertilizer is the use of it as bedding for cattle on the livestock farms, and the industrial manufacture of fertilizers by enriching the peat with mineral fertilizers, lime and ammonia water. Only then can the peat reserves become an efficient fertilizer for turf-podsol soils.

In addition tilled lands, meadows and pasture lands of the non-chernozem zone require mineral fertilizers on a wide scale: phosphate meal, superphosphate, potash and especially nitrogen fertilizers. Because of limited supplies, mineral fertilizers in the non-chernozem zone are limited mainly to flax and vegetables. But as the chemical industry expands, mineral fertilizers will also play a part in raising yields of grains and other crops.

The facts show that micro-fertilizers -- copper on peat soils, boron and molybdenum for clover -- are also efficient in the non-chernozem zone.

The non-chernozem zone, including Belorussia and the Ukrainian Poles'ye, includes at least 15 million hectares of sandy and clayey-sandy soils, whose fertility can be raised by sowing alfalfa as green manure.

The general statement can be made that while in the steppe regions yield increases depend on raising the moisture supply of the fields, the non-chernozem zone, already supplied with adequate precipitation, must rely on fertilizers to achieve higher yields.

A characteristic feature of the landscape of this zone is the fragmentation of plowland and other agricultural land by forests, brush and swamps into small tracts of one to three hectares. This impedes the use of machinery. One of the important problems is therefore the enlargement of tilled tracts by combining them into large fields through rooting out stumps and removing forest growth and tussocks. Work of this sort must also be done on meadows and pasture lands. Such reclamation is essential despite its high cost because the expenditures quickly pay for themselves through additional production.

The non-chernozem zone also contains large areas of natural hay fields and pastures, a total of about 30 million hectares. They are now marked by low productivity, but experience shows that "natural" fodder lands can be converted into highly intensive "artificial" hay fields and pastures with high yields and a grass composition of high quality. Such experience is already available for considerable areas in Estonia, Latvia, Belorussia, Moscow and other oblasts. It is a matter of pasture improvement, with the addition of a mixture of cultivated grasses of the necessary composition,

liming, fertilizer application, etc. Such improvement yields first-class and cheap pasturage and albumin-rich hay of the order of 1,500 to 2,000 feed units per hectare.

A most important reserve for increasing grain and fodder production in the non-chernozem zone lies in changing from clear fallow lands to occupied ones. In the past, three-field rotation prevailed here: rye, oats and fallow. One-third of the lands were kept in a clear fallow condition. With the change from the three-field system to other types of crop rotation the clear fallow area on the kolkhozes was reduced; however, they continued to be a "compulsory" link in crop rotations and occupied large areas. This was a tribute to tradition, and maintained the inertia characteristic of the three-field system of the past.

The social, economic and technical conditions in our agriculture have changed radically, but the clear fallow land has remained in the crop rotation, and in many kolkhozes 12 to 15 and more per cent of the plowland is still occupied by it, a fact that is quite unjustified either from the agro-technical or from the economic point of view. In Kirov Oblast, 23.8 per cent of the plowland was occupied by clear fallow land in 1958, in Bryansk Oblast, 12.8 per cent.

In the non-chernozem zone as a whole, clear fallow land in 1958 occupied over 5 million ha. This can no longer be tolerated. The December, 1959, plenum of the party's Central Committee stressed the necessity of using all these lands in regions of adequate moisture for sowings to increase grain production and expand the acreage of corn and other forage crops.

Some specialists affirm that yields of winter crops on the occupied fallow lands are considerably lower than on the clear fallow lands, but this ignores the fact that on the clear unfertilized fallow lands the yields of winter crops remain extremely low. The fact of the matter is that the clear fallow land is idle for a year and that the yield of winter crops should really be divided in half, since it is harvested from the field only once in two years. On the other hand, if fertilizers are applied, winter crops give high yields on occupied fallow lands, too, and the economy receives a large amount of additional produce.

How great is the advantage of occupied fallow lands over clear fallow may be seen from the following examples. On an average for 11 years on the Vladimir Il'ich kolkhoz in Moscow Oblast the harvest of winter crops on occupied fallow land amounted to 24.9 centners per ha., with 120 to 160 centners of early potatoes being obtained from each hectare of occupied fallow land. This is also confirmed by the experiments of the Farming Institute of the Central Non-Chernozem Zone (Nemchinovka , Moscow Oblast).

As may be seen from these data, the winter wheat yield from occupied fallow lands was 2 to 4 centners per ha. lower, but this small deficit of

wheat was compensated many times over by the yield of fallow-occupying crops. This brings the economy immense economic advantage.

Yield in centners per ha. on experimental fields

Crop rotations with	Fallow-occupying crops (5-year average)	Winter wheat (5-year average)	Grasses, first year of use (3-year average)	Grasses, second year of use (4-year average)	Spring wheat (4-year average)	Potatoes (2-year average)	Oats (2-year average)
"black fallow"	-	29.1	52.3	54.3	15.6	128.2	34.8
vetch-oats	41.7	27.0	50.5	54.2	15.0	130.8	36.3
potatoes	136.6	25.4	43.8	49.4	14.7	121.6	-

Such examples are numerous and all of them show convincingly that the replacement of clear fallow lands by occupied fallow is an immense reserve for the intensification of land use and increase of production in regions of adequate moisture.

The natural historical and economic conditions of the non-chernozem zone objectively indicate the necessity of specializing agriculture, above all along the line of dairy and dairy-and-beef cattle raising and hog raising for bacon.

Herein, we believe, lies the basis for all agriculture, and farming in the non-chernozem zone should be subordinated to these specialized branches. Just as in the regions of the East, where new lands are being developed, the basis of agriculture is a cereal cash-crop economy, so, with a corresponding development of animal husbandry, the non-chernozem zone of the European part of the country could become one of the regions of intensive animal husbandry, a base for the production of cheap milk and beef. There are extensive areas of meadow and pasture, which should be converted into sources of cheap feed. Adequate moisture and other favorable climatic factors, combined with fertilizer application, make it possible to obtain high and stable yields of grain crops, corn, potatoes and clover.

The main cash crops in many parts of the non-chernozem zone have long been and will be in the prospective future flax, potatoes and, in the suburban areas, vegetables. However, it would be wrong to suppose that conditions in the non-chernozem zone are unfavorable to grain production. On the contrary, with fertilizers and, above all, local manure, peat and other composts, and the development of clover sowing (as a source not only of high-albumin feed for cattle, but also for raising the fertility of the soils), large grain yields can be obtained here. Even now many kolkhozes where

a high level of farming has been attained get 18 to 20 and more centners of grain per hectare on the average for a number of years. As the chemical industry and the production of mineral fertilizers grow, and with the raising of the level of farming, the development of drainage reclamation, etc., the non-chernozem zone can become a great producer of cheap grain.

Corn should be especially mentioned. This crop is comparatively new in the non-chernozem zone and therefore it is underestimated in many cases. Practical workers, and even some specialists, through inertia, prefer oats. This is quite wrong. Corn can, according to objective data, and should occupy a conspicuous place in the feed balance in the non-chernozem zone. It is precisely by means of this crop that the problem of silage production must be solved. It is a matter of mastering the technique of cultivating this crop, raising and introducing the proper varieties and hybrids capable of yielding not only a large amount of green bulk, but also ears of milky-waxy maturity. On the other hand, while corn is the usual crop of field-crop rotation in the south and can be cultivated in almost any field, in the non-chernozem zone, in our opinion, it is not always advisable to introduce corn into the field crop rotation on a level with rye, wheat, potatoes and other crops.

Apparently it is most advisable to choose in each kolkhoz or sovkhoz the plot of land most suitable for corn, carefully fertilize and cultivate it and raise corn on it for a number of years without change.

History tells of age-old hemp fields in Orel and Kursk oblasts, continuous plantings of potatoes for decades in private peasant plots, etc. In Georgia peasants have grown corn for decades in the same fields. It is possible to cite many examples of the continuous cultivation of corn from the experience of scientific institutions. At the Mironovka experimental station corn planted continuously for 22 years yielded an average of 23 centners per hectare and, with the application of fertilizers, 30.9 centners. The search for, and the continual planting of corn on,the most favorable plots of land in the non-chernozem zone are all the more important because just any field may not be suitable for this crop.

There are many instances of high corn yields in the kolkhozes and sovkhozes of the non-chernozem zone. We refer only to the examples from the Belorussian SSR cited in the report by Comrade K. T. Mazurov to the December plenum of the party's Central Committee. The average yield of green corn bulk in Belorussia in 1959 was 400 centners per ha., and in Brest Oblast 500 centners. In 16 rayons of Belorussia the average corn yield reached 600 centners, in 183 kolkhozes over 800 centners, and 400 teams harvested 1,000 to 1,500 centners of green corn bulk per hectare.

The Lenin kolkhoz in Vurnary Rayon, Chuvash ASSR, in 1959 harvested from its entire sown area (200 ha.) 1,010 centners of corn per ha. with ears in the waxy maturity stage.

Thus, practice shows with undeniable certainty that corn in the non-chernozem zone can and should become a main source of silage, a reliable base for the development of dairy cattle and hog raising. Herein lies one of the most important farming tasks in this zone.

We have noted only the most essential farming problems in the non-chernozem zone. But it may be seen from the foregoing that the reserves here are truly inexhaustible. And although, from the viewpoint of ordinary geographic concepts, this densely populated zone is rather well studied, there are still not a few problems here that should become the object of the constant attention of geographers if one has in view not a simple description of the natural elements and their components, as has been the object of geography in the past, but the ascertainment of the opportunities for the fullest and most highly productive use of the natural resources in the interest of the development of agriculture.

To these problems belong the regulation of the water regime for the purpose of combating temporary or permanent waterlogging of soils over large areas; the location of easily accessible lime deposits, and the study of the possibilities of considerably expanding the plowland area at the expense of other lands. It may be said that this is not the business of geographers but the domain of specialists of other branches of science. But only those who conceive geography in the spirit of past centuries, as a purely descriptive science, can think this way. We believe under present conditions, when fewer and fewer "blank spots" remain on geographic maps, the geographer's task lies more and more emphatically in changing from a mere description of nature to an active transformation of it in the interest of developing productive forces.

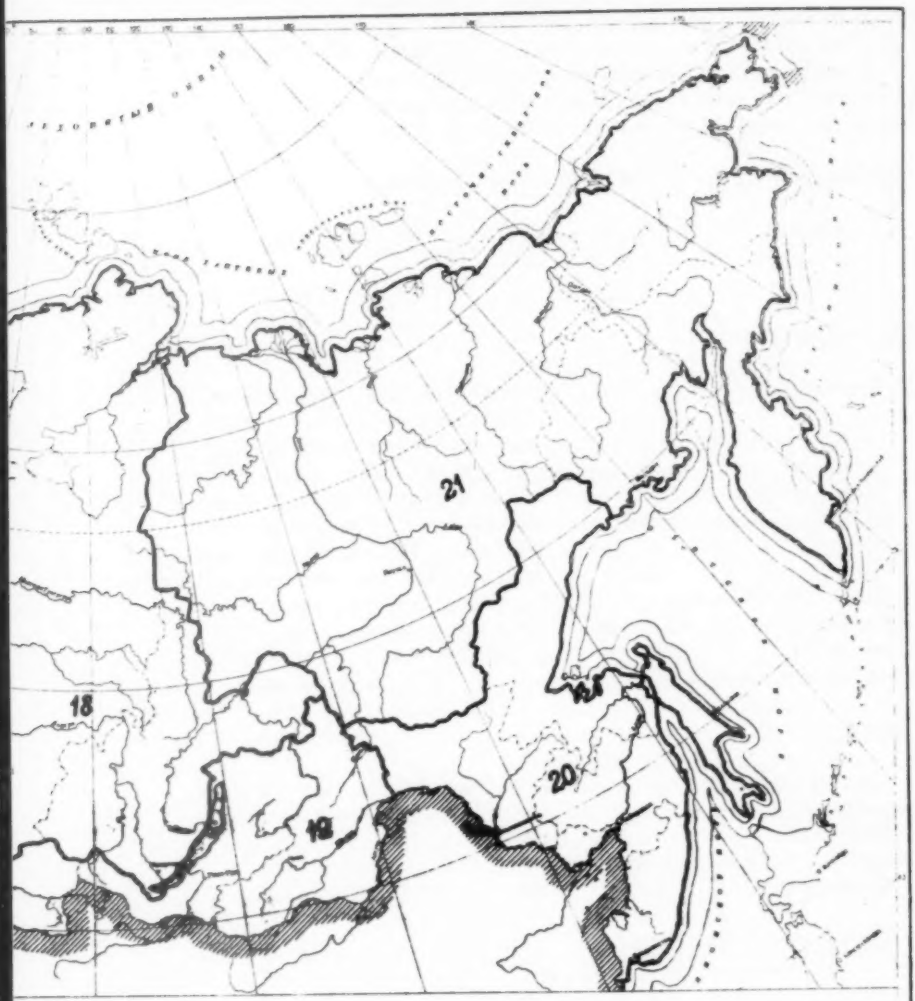
In our brief paper we have touched on the main farming problems as illustrated by two large and substantially different zones. As may be seen from the foregoing, the physical-geographic premises here are very different; they call for different approaches to the development of farming, different specialization, and require solutions to various technological and organizational problems.

Other regions of the country, by reason of their specific natural-historical and economic conditions, also have their local problems both in the technique and technology of agriculture and in the specialization and relationships of its branches. We are unable to discuss this in detail.

Soviet agriculture is developing in accordance with the natural conditions of various zones but not under their sway. We have already noted above that, as the productive forces, techniques and our knowledge grow and develop, man subordinates the elemental forces of nature more and more to himself and converts them to the benefit of his productive activity.

In the comparatively brief historical period of our country's existence as a Socialist state, a titanic labor has been performed under the party's

Fig. 1. Agricultural Zones of the USSR



СКОХОЗЯЙСТВЕННЫЕ ЗОНЫ СССР

leadership in the transformation of large regions and the development of agriculture on the basis of modern science and technique. Now this process will go forward even more rapidly. The Soviet Union, having entered the area of all-out Communist construction, possesses ever growing opportunities, on the basis of a more profound understanding of the laws of nature, for utilizing more fully and transforming the physical-geographic environment in the interest of the powerful development of agricultural production.

AGRICULTURAL ZONES OF THE USSR (See Map on Pages 16 - 17).

Zones	Specialization of zones
RSFSR (21 zones)	
Northern Caucasus	
1. Krasnodar kray	Sugar beets, seed corn, oil-bearing and essential-oil plants, orchards, vineyards, winter wheat, barley, milk-and-beef cattle, hogs, poultry.
2. Steppe of Ciscaucasia (Rostov Obl., Stavropol'Kray)	Winter and spring wheat, corn, orchards, vineyards and industrial vegetables. Fine-fleeced sheep, dairy-and-beef and beef cattle, poultry.
3. Mountain-steppe zone of the Northern Caucasus (Kabardino-Balkar, North Osetian, Chechen-Ingush and Dagestan ASSR's).	Orchards, vineyards, corn and industrial vegetables. Fine-fleeced sheep, beef-and-dairy cattle.
Southeast	
4. Caspian zone (Astrakhan' Obl., Kalmyk ASSR)	Fine-fleeced sheep, beef cattle. Industrial vegetables and melons.
5. Southeast (Kuybyshev, Saratov, Stalingrad and Orenburg obls.)	Spring and winter wheat, rye, millet, mustard, dairy-and-beef and beef cattle, hogs, fine-fleeced sheep.
6. Central Chernozem Oblasts	
Central chernozem zone (Voronezh, Kursk, Belgorod, Orel, Tambov and Lipetsk obls.)	Sugar beets, sunflowers, hemp, winter rye, winter and spring wheat, corn, buckwheat, legumes, orchards, milk-and-beef cattle, hogs, poultry.
7. Eastern forest-steppe (Penza and Ul'yanovsk obls., Mordvian, Chuvash and Tatar ASSR's)	Dairy-and-beef cattle, hogs. Rye, spring wheat, legumes. Hemp, sunflowers.
Non-chernozem zone	
8. Southern non-chernozem zone (Ryazan' and Tula obls.)	Milk-and-beef cattle, hogs, poultry. Sugar beets, potatoes, vegetables, orchards.

9. Central non-chernozem zone (Moscow, Smolensk, Kalinin, Ivanovo, Kostroma, Yaroslavl', Gor'kiy, Vladimir, Kaluga and Bryansk obls.)	Milk-and-beef cattle, hogs, poultry. Flax, winter rye, legumes, potatoes, vegetables and berries.
10. Eastern non-chernozem zone (Kirov obl., Mari and Udmurt ASSR's)	Dairy-and-beef cattle, hogs, flax, rye, legumes.
Northwest	
11. Northwestern non-chernozem zone (Leningrad, Novgorod, Pskov and Kaliningrad obls.)	Dairy-and-beef cattle, hogs, poultry. Flax, potatoes, vegetables, berries.
12. European North (Karelian and Komi ASSR's, Vologda and Arkhangel'sk obls.)	Dairy-and-beef cattle, reindeer. Flax, vegetables, potatoes.
13. Urals Central Urals (Sverdlovsk and Perm' obls.)	Dairy-and-beef cattle, hogs, poultry. Potatoes, vegetables, rye, legumes.
14. Southern Urals (Bashkir ASSR, Kurgan and Chelyabinsk obls.)	Dairy-and-beef and beef cattle, hogs, sheep, poultry.
Western Siberia	
15. Western Siberia (Tyumen', Omsk and Novosibirsk obls.)	Spring wheat, linseed flax, dairy-and-beef cattle, hogs, sheep.
16. Altay kray	Spring wheat, linseed flax, dairy-and-beef and beef cattle, fine-fleeced sheep, hogs.
17. Northeast of Western Siberia (Tomsk and Kemerovo obls.)	Dairy-and-beef cattle, hogs, potatoes, vegetables.
Eastern Siberia	
18. Eastern Siberia (Krasnoyarsk kray and Irkutsk obl.)	Spring wheat, dairy-and-beef and beef cattle, hogs, sheep.
19. Transbaykalia and Tuva (Buryat ASSR, Chita obl. and Tuva aut. obl.)	Sheep, beef cattle. Spring wheat, barley.
20. Far East (Khabarovsk and Maritime krays, Amur and Sakhalin obls.)	Dairy-and-beef cattle, hogs. Soybeans, spring wheat, potatoes, vegetables.
21. Extreme North (Murmansk, Magadan and Kamchatka obls., Yakut ASSR)	Reindeer, dairy-and-beef cattle. Potatoes, vegetables.

UKRAINIAN SSR (6 zones)

22. Poles'ye (Volyn, Rovno and Zhitomir obls., northern L'vov, Khmel'nitskiy, Kiev, Chernigov and Sumy obls.)	Dairy-and-beef cattle, hogs. Flax, hemp, rye, winter wheat, corn, buckwheat, legumes, potatoes, sugar beets.
23. Forest-steppe (Ternopol', Chernovtsy, Khmel'nitskiy, Vinnitsa, Cherkassy, Poltava obls., southern L'vov, Volyn, Rovno, Zhitomir, Kiev, Chernigov and Sumy obls., northern Drogobych, Odessa and Kirovograd obls., eastern Stanislav obl., northeastern Khar'kov obl.)	Sugar beets, winter wheat, corn, buckwheat, legumes, sunflowers. Dairy-and-beef cattle, hogs, poultry.
24. Northern and Central Steppe (Dnepropetrovsk, Kirovograd, Stalino, Odessa, Zaporozh'ye, Lugansk obls., southeastern Khar'kov obl., northern Nikolayev obl.)	Corn, winter wheat, barley, millet, sunflowers, orchards. Dairy-and-beef cattle, hogs, poultry.
25. Southern Steppe (Kherson obl., part of Nikolayev, Odessa and Crimean obls.)	Corn, winter wheat, barley, orchards, vineyards, vegetables. Dairy-and-beef cattle, hogs, sheep, poultry.
26. Mountain and foothill regions of Crimea	Vineyards, orchards, canning vegetables, tobacco, essential-oil plants. Sheep, dairy-and-beef cattle.
27. Foothill and mountain regions of the Carpathians (Transcarpathian obl., part of Stanislav and Chernovtsy obls.)	Beef-and-dairy cattle, sheep. Vineyards, orchards, corn, vegetables, hemp, sugar beets.

BELORUSSIAN SSR (3 zones)

28. Northern (Vitebsk, Molodechno obls., and northern part of Minsk obl.)	Flax, potatoes. Dairy-and-beef cattle, hogs, poultry.
29. Central (Grodno, Minsk and Mogilev obls.)	Potatoes, dairy-and-beef cattle, hogs.
30. Southern (Brest, Gomel' obl., and small parts of Minsk and Mogilev obls.)	Hemp, sugar beets. Beef-and-dairy cattle.

31. UZBEK SSR[1] (3 zones)	Cotton, vegetables, melons, orchards, vineyards. Sheep, dairy-and-beef cattle, silk.
KAZAKH SSR (6 zones)	
32. Steppe (Northern Kazakhstan and Kokchetav obls., northern and central rayons of Kustanay obls., northern rayons of Akmolinsk and Pavlodar obls.)	Spring wheat, millet, oil flax. Dairy-and-beef cattle, sheep, hogs.
33. Dry Steppe (Northern rayons of Western-Kazakhstan and Aktyubinsk obls., southern dry-steppe rayons of Kustanay obl., central and southern rayons of Akmolinsk and Pavlodar obls., northern rayons of Karaganda obl., northern and central rayons of Semipalatinsk obls.)	Spring wheat, millet, linseed flax.
34. Semidesert (Central and southern rayons of Western-Kazakhstan obl., central rayons of Aktyubinsk obl., southern rayons of Kustanay obl., Karaganda obl. (except 4 northern rayons), Bayan-Aul rayon of Pavlodar obl. and southern rayons of Semipalatinsk obl.)	Semi-fine-fleeced and meat-and-tallow sheep, beef cattle, herds of horses.
35. Desert (Gur'yev and Kzyl-Orda obls., southern rayons of Aktyubinsk obl., northern stock-raising rayons of Southern-Kazakhstan, Dzhambul and Alma-Ata obls., Burlyu-Tyube rayon of Taldy-Kurgan obl.)	Meat-and-tallow and astrakhan sheep, beef cattle and horses.
36. Tien Shan (Taldy-Kurgan, Alma-Ata, Dzhambul and Southern-Kazakhstan obls., with the exception of certain rayons assigned to the stock raising zone).	Irrigation and dry farming, cotton, sugar beets, tobacco. Dairy-and-beef cattle, fine-fleeced sheep, hogs.
37. Altay-Mountains (Eastern-Kazakhstan obl.)	Spring wheat, sunflowers. Beef and beef-and-dairy cattle, sheep.

38. GEORGIAN SSR[1] (11 zones)	Tea, citrus fruits, orchards, vineyards, industrial vegetables. Dairy-and-beef cattle, sheep, silk.
39. AZERBAYDZHAN SSR[1] (10 zones)	Cotton, orchards, vineyards, industrial vegetables. Dairy-and-beef cattle, sheep, silk.
40. LITHUANIAN SSR[1] (3 zones)	Dairy-and-beef cattle, meat and bacon hogs. Potatoes, sugar beets, flax.
41. MOLDAVIAN SSR[1] (4 zones)	Vineyards, orchards, industrial vegetables, corn, winter wheat, tobacco, sugar beets, sunflowers, essential-oil plants. Dairy-and-beef cattle, hogs and sheep.
42. LATVIAN SSR[1] (5 zones)	Dairy-and-beef cattle, meat and bacon hogs. Potatoes, sugar beets, flax.
43. KIRGHIZ SSR[1] (7 zones)	Cotton, vineyards, orchards, sugar beets, tobacco, medicinal plants. Sheep, beef-and-dairy cattle, silk.
44. TADZHIK SSR[1] (7 zones)	Cotton, vineyards, orchards. Sheep, beef-and-dairy cattle, silk.
45. ARMENIAN SSR[1] (9 zones)	Vineyards, orchards, vegetables, cotton, tobacco. Sheep and beef-and-dairy cattle. Silk.
46. TURKMEN SSR[1] (3 zones)	Cotton, orchards, vineyards, melons, wool and karakul sheep, beef cattle. Silk.
47. ESTONIAN SSR[1] (5 zones)	Dairy-and-beef cattle, meat and bacon hogs, potatoes, vegetables, flax.

(1) Zones not shown on map.

Poultry is raised in all zones of the country, and vegetables and potatoes in the suburban and industrial regions. Production of hardy winter wheats is concentrated in the southern regions of the European part of the country; that of durum - spring wheats in the eastern regions, the Volga and the southern Urals.

—

EXPERIENCE IN DISTINGUISHING AGRICULTURAL ZONES AND REGIONS ON THE AGRICULTURAL MAP OF THE USSR

By M. I. Nikishov

The resolutions of the 21st party congress and the December, 1959, Plenum of the Central Committee outline an extensive scientific-research program for the further development of all the branches of Socialist agriculture. The execution of this program will insure a growth of agricultural production in the USSR that will make it possible to supply the population with food products in abundance and in a wide assortment of high quality, and to satisfy all the other requirements of the state for agricultural products.

The measures outlined in the party resolutions insure the solution of the main economic task in the field of agriculture: to catch up to the United States in the next few years in the per capita production of meat, milk, butter and other agricultural products.

The fulfillment of the seven-year plan of agricultural development for 1959-65 will be based on the implantation of scientific systems of agricultural management. This will require a thorough study of the geography and economics of agriculture, the realization in practice of Lenin's principle of taking local conditions into account. In 1922 V. I. Lenin wrote: "Agriculture in the Kaluga Guberniya is not the same as in the Kazan' Guberniya... The same applies to all of industry. The same applies to all administration or management. Not to take into account the local differences in all these questions would mean lapsing into bureaucratic centralism. It would mean interfering with local workers in the consideration of local conditions, which is the basis of rational work." (V. I. Lenin, Soch. (Collected Works), Vol. 33, 4th edition. p. 327). In accordance with Lenin's admonitions, the Central Committee constantly demands that the leading cadres systematically and persistently "study the natural and economic peculiarities of their regions, the individual branches and the crops involved in agricultural production." (Resolution of the party plenum of January, 1955, Pravda, Feb. 2, 1955).

One of the basic methods of distinguishing and taking into account local characteristics of agricultural production is agricultural regionalization, that is, the distinction of integrated agricultural zones differing in conditions, character and results of production, and also in the basic tasks facing these zones in the further development of their agriculture.

One of the important tasks of Soviet geography and cartography is the study of the constituted zones of production specialization both in the USSR as a whole and in the individual regions. The constituted agricultural zones can be studied well on integrated maps, which facilitate the simultaneous survey of agriculture and show its complex character and the relations and interdependence between branches. Such maps reflect the integral picture of the agricultural production of the territory to be mapped.

The complex agricultural map shows the distribution of agricultural production in its dependence upon the natural and economic conditions, represents all agriculture as a whole, aids in establishing the laws of its distribution in greater detail, summarizes the results and gives a compendium of our knowledge of the geography of agriculture for a definite period of time.

The working out of a complex map of agriculture of the whole USSR has great scientific and practical significance. The map will aid wide circles of the population in studying the distribution and specialization of the country's agriculture; it will be a valuable aid to agricultural specialists in orienting themselves in the distribution of crops and branches by regions and zones of the USSR. The map will find employment in the various agricultural educational institutions.

The timeliness of the elaboration of a complex agricultural map of the whole USSR will become more understandable if we take into account that we have at present no full-fledged map at a sufficiently large scale, and that all of the maps of this sort published earlier are very schematic and highly obsolete, and do not reflect the immense changes that have occurred in USSR agriculture in the post-war years as a result of the successful realization of party resolutions.

The first agricultural map published under Soviet rule (1919), on which agricultural regions are distinguished, is the schematic map of the agricultural oblasts and rayons, compiled by Prof. A. G. Doyarenko. The agricultural oblasts in this map are distinguished on the basis of natural conditions, while the rayons are distinguished on the basis of the predominance of a given crop. "The major oblasts are distinguished," writes the author, "by soils and climate and by the distribution of lands (forest, plowland, meadow, etc.); the division of the oblast into smaller rayons was done on the basis of the dominant crops. Thus, we distinguished rayons and 15 oblasts, arranged in zones in conformity with changes in climate, soils, vegetation and the distribution of lands, as well as the conditions of the economy."

Constructed on the same basis was the schematic map of agricultural experimental fields published in 1927, on which 23 agricultural oblasts were distinguished.

In the period from 1925 to 1930 several general economic maps of an educational character were published, on which background coloring distinguished the agricultural zones and regions. These maps were very schematic. The economic map of the European part of the USSR published under the editorship of Yu. M. Shokal'skiy, for example, distinguished the following zones: (1) reindeer raising, hunting and fishing, (2) farming and livestock raising, (3) stock raising with small farming.

Equally primitive is the economic map of the European part of the USSR by Vol'f, Den and Mebus, which distinguishes forest, farming-and-stock-

raising and stock-raising-and-forest regions. In identifying agricultural regions the authors used indices of the distribution of lands by types, the size of the sown areas, the number of head of cattle and other indices. In the explanatory text to the map the authors write that "the characterization of the economy on the main map should be based on the fundamental agricultural differences in the various localities of the European part of the Union."

On the map of agricultural specialization attached to G.N. Cherdantsev's work, Osnovy sel'skokhozyaystvennoy geografii (Principles of Agricultural Geography) (1931), 43 agricultural regions are distinguished. The identification of regions is based on production specialization, not only those already constituted, but also those in prospect. "Wheat or cotton regions," writes G. N. Cherdantsev, "are those regions where wheat or cotton grow or can grow in our country."

In the 10th volume of the Little Soviet Encyclopedia, published in 1940, there are general economic maps compiled by Prof. N. S. Frolov, on which the coloring of the background distinguishes agricultural zones and regions (21 units in the European part and 14 in the Asiatic part). The names of the agricultural zones and regions indicate the leading crops and branches, for example barley regions with dairy farming and hog raising, etc. However, on these maps animal husbandry does not enter into the characterization of the agricultural zones and regions as an inseparable part of agricultural production, but is noted by supplementary symbols or is not given at all.

Very informative complex agricultural maps were compiled by A. N. Rakitnikov. On the map published in the journal Geografiya v shkole, 1941, No. 3, 21 agricultural zones and regions are distinguished by figures. A new map of agricultural specialization of the USSR, distinguishing 25 agricultural zones and regions, was published in 1958. Although this map is better than the one published in 1941, it is at a small scale, very schematic and, of course, does not give an adequate characterization of agriculture.

In 1952 the Main Administration of Geodesy and Cartography published a complex wall map of the agriculture of the USSR at a scale of 1:5,000,000, on which the coloring of the background shows 21 regions of production specialization of agriculture. This map contains more than all those published earlier, but its designation as a teaching aid for middle schools prevented the presentation of a detailed characterization of agriculture. By now this map has become obsolete. Since its publication in 1952 major changes have occurred in the agriculture of the USSR as a result of the development of virgin and idle lands and the expansion of grain crops, especially corn.

In the post-war period the Council for the Study of Productive Forces of the Academy of Sciences of the USSR has done a great deal of work on the

natural and agricultural regionalization of the USSR. As a result of this work, a map of the specialization of USSR agriculture has been compiled and published in schematic form in the journal Planovoye khozyaystvo (Planned Economy) (No. 4, 1955). This map, compiled under the editorship of Academician V. S. Nemchinov, distinguishes 18 zones of production specialization of agriculture. The boundaries between the zones are drawn schematically, and in some cases the identification of zones does not seem very convincing.

A survey of the published complex agricultural maps of the whole USSR permits one to draw certain conclusions:

1. All the earlier published complex agricultural maps are quite obsolete in content and do not reflect the present geography of USSR agriculture.
2. In distinguishing agricultural zones and regions, discrepancies are observed in the classification, the choice of indices and the method of distinguishing and characterizing zones and regions.
3. Experience with the published agricultural maps and a survey of the current literature show that the problem of detailed agricultural regionalization in our country is still far from being solved.

The defects in the elaboration of complex agricultural maps may be explained in part by the fact that the compilers did not use statistical materials. As a result of work on the forthcoming atlas of USSR agriculture extensive material has been accumulated for the zonal characterization of agriculture. The processing of these materials has made it possible to compile a complex map of USSR agriculture at a scale of 1:4,000,000.

The main content of the map is the regional specialization of agriculture. In distinguishing regions it is necessary to take into account V. I. Lenin's admonitions and the resolutions of the Communist party. In his classic work, The Development of Capitalism in Russia, Lenin wrote: "By the very nature of farming, its conversion into commercial production has taken place in a special way, differing from the corresponding process in industry. The processing industry splits up into separate, independent branches, devoted exclusively to the production of one product or one part of a product. The farming industry does not split up into entirely separate branches, but specializes only in the production of one market product in one case and another in another case, with the remaining aspects of agriculture being adapted to that principal (i.e. market) product" (V. I. Lenin, Soch. (Collected Works), Vol. 3, p. 267).

These statements by Lenin referred to capitalist countries. However, the above methodical admonitions, deriving from the very nature of farming, are also applicable to Socialist agriculture.

The specialization of USSR agriculture is based on commercial production, which is a major index of the progress of Socialist agriculture. Accordingly, the map of USSR agriculture distinguishes primarily the crops and branches providing the country with raw materials and foodstuffs.

In establishing zones of specialization, one of the main characteristics of Socialist agriculture was taken into consideration, namely its complex diversified character. Each republic, kray or oblast produces two or three leading crops and branches of nation-wide or inter-regional significance and several supplementary or ancillary ones closely connected with the leading crops.

The production specialization of agriculture on the map is represented by coloring the background and by entering on this background the detailed areas and symbols. This principle of mapping results from the complex diversified character of Socialist agriculture.

The identification of the leading crops and branches on the map was done on the basis of various statistical materials on total production expressed in kind and in money, on the cash receipts of the kolkhozes, the types of land, the sown areas and the number of livestock, the production of the main farming and animal products per 100 hectares of agricultural land, a large part of these materials having been worked up by rayons.

Cartograms were compiled to show the distribution of individual agricultural indices. In addition to cartograms showing the distribution of agricultural lands and crops and total production, the compilers prepared cartograms showing the percentage of cows among the total cattle, the percentage of sheep with fine and semi-fine wool in the total number of sheep, the number of cattle per 100 hectares of agricultural land, plowland (in the case of hogs) and grain crops (in the case of poultry), milk yield per cow, and the wool clip per sheep. On the basis of the separate cartograms the compilers prepared composite cartograms on farming, animal husbandry and lands.

Maps (at a scale of 1:4,000,000) were compiled to show the distribution of enterprises for the processing of agricultural raw materials, with identification of raw-material zones assigned to a given industry. A map was also compiled to show the distribution of sovkhozes, with indication of their specialization.

On the basis of all these materials the territory of the USSR was divided first into regions with a predominance of farming or animal husbandry. The division of the country into animal-husbandry and farming sections took into account the distribution and the quality of the land. Large-scale topographic maps were used to compile a map sketch identifying the plowland areas. On the plowlands, as a rule, farming predominates; on the pastures and hayfields, animal husbandry; and in the forests, hunting and food gathering.

In accordance with Lenin's suggestions, the farming regions were subdivided further into smaller parts according to the leading crops, and the animal-husbandry regions according to the predominant kind of livestock.

At present animal husbandry is being developed everywhere in the farming

regions, and farming in the animal-husbandry regions. Hence, in characterizing the farming regions the trend of animal husbandry is noted, and in the animal-husbandry regions the most important farming trends are stressed.

In identifying the trend of animal husbandry, all livestock were converted into cattle, which made it possible to establish more correctly the predominance of any given livestock in a zone or region. In establishing the trends in the development of cattle, the proportion of cows was taken into consideration, and in establishing the trends in the development of sheep raising the percentage of sheep with fine or semi-fine wool was taken into account.

The map (not available for reproduction - Editor, S. G.) shows the specialization of agriculture as of 1959. In identifying agricultural zones and regions account was also taken of the prospects of development of agriculture under the seven-year plan.

On the basis of study of all these sources, consideration of the significance of a given crop or branch in the economy of a region and its place in the structure of farming and animal husbandry, and an analysis of the distribution of the sovkhozes, the agricultural processing industry, the large cities and other economic indices, the map distinguishes the following agricultural zones and regions:

1. The grain-and-animal-husbandry, sugar-beet and sunflower zone of the steppe regions of the Ukraine and the Northern Caucasus.
"Winter wheat and corn (more than 30 per cent of the sown area, over 40 per cent of the total production and 25 per cent of the cash receipts), sunflowers (6 to 12 per cent of the sown area), sugar beets, sheep, orchards and vineyards, dairy cattle, hogs, sheep and poultry."
2. Grain-sunflower zone with beef-and-dairy cattle and sheep in the forest-steppe regions of the Volga. "Spring wheat, rye, corn, millet (cereals occupy more than 50 per cent of the sown area), sunflowers, potatoes and vegetables, beef-and-dairy cattle, sheep, hogs and poultry."
3. Wheat zone with industrial crops, beef-and-dairy cattle and sheep in the steppe regions of Northern Kazakhstan, the Urals and Western Siberia.
"Spring wheat, millet, corn (cereals occupy more than 50 per cent of the sown area and total production), occasional sowings of sunflowers, linseed flax, mustard, false flax, beef-and-dairy cattle, fine-fleeced and semi-fine-fleeced sheep."
4. Grain-and-animal-husbandry zone with sowings of vegetables and industrial crops of the forest-steppe oblasts of the non-chernozem and chernozem center.
"Grain crops (rye, wheat, corn, millet, buckwheat), giving more than 30 per cent of the total production; sugar beets, occasionally considerable sowings of fiber flax and hemp. Dairy-and-beef cattle, hogs, sheep and poultry."
5. Grain and animal-husbandry zone of Western Siberia. Cereals 40 to 50 per cent of total production (spring wheat, rye, corn, oats), dairy cattle (30 to 40 per cent of the cash receipts of kolkhozes),

occasional sowings of fiber flax, hemp, sunflowers, linseed flax and false flax.

6. Grain-meat-wool-and-animal-husbandry zone of Eastern Siberia. "Spring wheat, corn (cereals form more than 40 per cent of total production); occasional sugar beets, fiber flax, dairy-and-beef cattle, hogs, fine-fleeced and semi-fine-fleeced sheep."

7. Grain, dairy-cattle and soybean zone of the Far East. "Spring wheat, rye, oats, buckwheat (cereals give 30 to 40 per cent of cash receipts), soybeans, small sowings of sunflowers and dairy-and-beef cattle."

8. Grain (wheat and rice), soybeans, sugar-beet and dairy-and-beef cattle region of the Far East.

"Spring wheat, corn, rye, oats, rice (cereals give more than 40 per cent of all cash receipts of kolkhozes and occupy over 50 per cent of the sown area), soybeans, sugar beets, dairy-and-beef cattle, panty deer (raised for their horns, called panty, which in powdered form are a highly prized Chinese medicine) and fur farming.

9. Orchard-and-vineyard, sheep and tobacco regions of the Caucasus. "Orchards, vineyards, vegetables, tobacco, winter wheat, corn, barley and some rice."

10. Fruit-and-vineyard and farming-and-animal-husbandry zone of Soviet Central Asia.

"Orchards, vineyards, sowings of industrial crops (linseed flax, sesame, safflower, grain crops,(wheat, corn, barley, rice), dairy-and-beef cattle and silk."

11. Region of diversified industrial and grain crops and mutton-and-wool animal husbandry of Southern Kazakhstan and Northern Kirghizia.

"Sugar beets, fiber and oil crops (jute, southern hemp, safflower, oil poppy), orchards and vineyards, rice, winter wheat, barley, mutton-and-wool and karakul sheep."

12. Zone of flax raising, grain crops and dairy-and-beef cattle of the non-chernozem zone of the European part of the USSR.

"Fiber flax (25 to 40 per cent of total production and 30 to 50 per cent of cash receipts), potatoes (10 to 17 per cent of total production), various grain crops (rye, buckwheat, corn, oats and barley), clover, dairy cattle and hogs."

13. Region of various industrial crops, potatoes and dairy-and-beef cattle of the Poles'ye Lowland.

"Fiber flax, hemp (30 to 40 per cent of cash receipts of kolkhozes), potatoes, cereals (rye, wheat, corn), dairy cattle and hogs."

14. Hemp-and-grain, sugar-beet and dairy-and-beef cattle region of the Chernozem Center.

"Hemp (25 to 40 per cent of cash receipts), sugar beets, potatoes and vegetables, wheat, rye, corn (cereals furnish up to 30 per cent of cash receipts), dairy cattle, hogs and poultry."

15. Beet-sugar-and-grain, dairy cattle and hog-raising zone of the Ukraine and the Chernozem Center.

"Sugar beets (20 to 25 per cent of total production and 30 to 35 per cent of cash receipts), winter wheat and corn (cereals furnish 20 to 25 per cent of total production), sunflowers, dairy-and-beef cattle, hogs and poultry."

16. Zone of cotton raising, orchards, vineyards and silk raising of Soviet Central Asia, Southern Kazakhstan and Transcaucasia.

"Cotton (more than 50 per cent of total production and 60 to 70 per cent of cash receipts of kolkhozes), orchards, vineyards and silk; rice wherever ground water is available."

17. Zone of vineyards, fruit orchards and tobacco raising of southern regions of European part of USSR and Caucasus.

"Vineyards, fruit orchards and tobacco (furnish 15 per cent of total production and 25 to 40 per cent of cash receipts), grain crops and mutton-and-wool sheep."

18. Zone of subtropical crops of the Black Sea coast of the Caucasus and Azerbaydzhan.

"Tea, citrus fruits (lemons, oranges, tangerines), tung nut trees, yellow tobaccos, vegetables."

19. Region of vegetable and melon raising of the Volga-Akhtuba floodplain.

"Vegetable and melon crops (tomatoes, watermelons, etc., furnish more than 50 per cent of total production and cash receipts), small sowings of cereals (rice)."

20. Zone of dairy cattle and pork and bacon hog raising in combination with sowings of flax and sugar beets in the Baltic region.

"Dairy cattle, meat and bacon hogs (more than 50 per cent of total production), potatoes and vegetables, sowings of fiber flax and sugar beets, cereals (rye, corn, oats) and grasses."

21. Zone of desert-pasture animal husbandry of the Volga, the Southern Urals and Northern Kazakhstan.

"Meat-and-wool, fine-fleeced and semi-fine-fleeced sheep (20 per cent of total production and 25 to 30 per cent of cash receipts), occasional areas of beef cattle, camel raising and farming."

22. Zone of desert-pasture sheep and karakul-sheep raising of Southern Kazakhstan and Soviet Central Asia.

"Karakul sheep, mutton-and-wool and semi-fine-fleeced sheep (more than 50 per cent of total production of agriculture), camels, occasional farming areas."

23. Region of mountain-pasture animal husbandry of the Crimea and the Carpathians.

"Mutton-and-wool sheep, dairy-and-beef cattle, occasional orchards and vineyards, and general farming."

24. Region of mountain-pasture animal husbandry of the Caucasus.

"Dairy-and-beef cattle, mutton-and-wool sheep on winter and summer pastures, occasional vineyards, orchards and sowings of cereals."

25. Region of mountain-pasture animal husbandry of Soviet Central Asia and Kazakhstan.

"Mutton-and-wool sheep, beef-and-dairy cattle, general farming (dry or irrigation) along the river valleys."

26. Region of mountain-pasture animal husbandry of Western and Eastern Siberia.

"Mutton-and-wool, fine-fleeced and semi-fine-fleeced sheep, beef cattle, isolated areas of general farming."

27. Sheep-raising, beef-and-dairy and grain zone of the Tuva Autonomous Oblast and Transbaykalia.

"Fine-fleeced and semi-fine-fleeced sheep (40 to 50 per cent of total production), beef-and-dairy cattle, spring wheat (more than 50 per cent of the sown area), considerable sowings of barley, millet and buckwheat, potatoes and vegetables, occasional sugar beets."

28. Hunting-and-fishing zone of Siberia and the Far East.

"Hunting for fur and sea animals, fishing, gathering of wild fruits, reindeer and fur farming, occasional farming around towns and industrial centers (vegetables, potatoes, milk).

29. Animal-husbandry and farming region of Yakutia.

"Beef-and-dairy cattle (more than 70 per cent of total production), reindeer raising and hunting; in the valleys of the Lena River and its tributaries, spring wheat, rye, barley, potatoes and vegetables."

30. Dairy cattle and farming along the river valleys in the regions of the European North and the Urals.

"Beef-and-dairy cattle (over 50 per cent of total production and cash receipts of kolkhozes), based on natural hayfields and sown grasses (15 to 20 per cent of the sown areas), small sowings of barley, oats, rye and wheat."

31. Reindeer-raising and fishing-hunting-and-gathering zone of the tundra and forest-tundra.

"Reindeer raising (more than 50 per cent of total production and cash receipts), hunting for fur and sea animals, gathering of furs and eggs, wild fruits and berries; small areas of farming and animal husbandry near industrial centers and port towns."

32. Vegetable-and-potato and dairy zones near towns.

"Vegetables, potatoes, fruits and berries, production of milk and pork, sowings of cereal and cattle feed crops."

The illustrative character of the map requires simple, brief and clear formulations in the legend, but in view of the complex character of Socialist agriculture the characterizations of the zones and regions indicate the two or three leading crops and branches and some supplementary and ancillary ones closely connected with the leading crops.

But no matter how complete the characterizations in the legend may be, there still remain quite a few branches and crops not noted in the background characterization but possessing significance for individual regions. Such crops(long-staple cotton, kenaf, jute, sesame, safflower, castor oil, false flax, linseed flax, essential-oil plants, mustard and others)are shown on the map by areas or closed curved lines.

Also entered on the map are isolated spots of general farming in the North, important centers of fur farming, centers of fishing and hunting for sea animals. Although some of these branches, for example, fishing and hunting for sea animals, do not belong to agriculture, they must be shown on the map because they are closely connected with agriculture and a part of the kolkhozes and kolkhozniks is engaged in these occupations.

To supplement the main map, three inset maps show grain farming and beef cattle most fully: (1) a map showing the distribution of the chief grain crops, wheat, rye, rice, millet and buckwheat by the area method; (2) a map showing the distribution of corn sowings by the dot method; (3) a map showing meat production per 100 hectares of agricultural land by the cartogram method.

In order to stress more strongly the connection between agricultural production and the natural environment, two other inset maps are placed on the main map: (1) a soil map and (2) a map of agroclimatic resources.

In order to reflect the enormous changes that have occurred in the agriculture of the USSR during the years of Soviet rule, especially in the period from 1953 to 1959, and also the prospects of the development of agriculture under the seven-year plan, vacant spaces on the map are filled with diagrams characterizing the growth of sown areas and number of livestock, the output of farm and animal products in the USSR as a whole and in comparison with the United States, the development of virgin and idle lands, the mechanization of agriculture, and so forth.

In conclusion it is necessary to note that in distinguishing agricultural zones and regions we proceed from narrow cartographic purposes. Our task did not comprise the working out of a scheme of agricultural regionalization of the USSR. Our map shows the constituted zones of agricultural specialization.

Nevertheless, a map of USSR agriculture at a sufficiently large scale will have great scientific and practical significance; it will aid in the study of the geography of agriculture, in the planning and location of agricultural production, and in the working out of problems of agricultural regionalization.

The constituted agricultural zones distinguished on the map reflect clearly enough the zonal characteristics of the natural conditions of the USSR, and emphasize the connection between the specialization of agriculture and the physical-geographic environment. This in turn results in the frequent coincidence of agricultural zones with natural zones. A comparison of the agricultural zones and regions identified on the map with the natural zones permits one to distinguish definite laws in the distribution of the various kinds of agricultural production in the USSR.

THE PHYSICAL-GEOGRAPHIC REGIONALIZATION OF THE UKRAINIAN SSR FOR AGRICULTURAL PURPOSES

By A. I. Lan'ko, A. M. Marinich, V. P. Popov, O. V. Poryvkina and P. N. Tsys'

The further steep rise in the national economy of the USSR, the improvement in the distribution of the productive forces, the correct specialization and integrated development of the various regions of the country and the remodeling of the organizational forms of industrial and agricultural management make it necessary to take thorough account of local natural and economic conditions. An analysis of the internal natural differences and a scientific justification of measures for the rational and most efficient economic utilization of natural conditions and natural resources can be accomplished through natural-geographic regionalization.

The physical-geographic regionalization of the Ukrainian SSR is a component part of scientific research in the natural-geographic regionalization of the USSR for agricultural purposes that is being carried on by the universities of all the republics. The universities of the Ukraine started to fulfill this collective program in 1957. At a scientific conference on the natural-geographic regionalization of the Ukrainian SSR prepared and conducted by the Geography Faculty of Kiev University and the Geographical Society of the Ukrainian SSR in June, 1957, general principles were worked out and work was co-ordinated for the physical-geographic regionalization of the Ukraine. A resolution of the conference created a scientific-methods co-ordinating bureau made up of the representatives of all the member universities, some teachers colleges that were included in the research on physical-geographic regionalization, and representatives of the State Planning Commission, the Ministry of Agriculture and the Academy of Agricultural Sciences of the USSR. The scientific-methods bureau has worked out a plan and general methodical instructions for the physical-geographic regionalization of the Ukraine for agricultural purposes.

To carry on special-purpose field investigations in the physical-geographic regionalization of the Ukrainian SSR the territory was distributed among universities as follows: Kiev University received the Kiev, Zhitomir, Chernigov, Cherkassy, Dnepropetrovsk, Kherson and Zaporozh'ye oblasts; L'vov University, the L'vov, Volyn', Rovno, Ternopol', Stanislav and Drogobych oblasts; Chernovtsy University, the Chernovtsy, Transcarpathian and Khmel'nitskiy oblasts; Odessa University, the Odessa, Nikolayev, Kirovograd and Vinnitsa oblasts; Khar'kov University, the Khar'kov, Poltava and Sumy oblasts; Lugansk Teachers College, the Stalino and Lugansk oblasts; and the Crimean Teachers College, the Crimean Oblast. (The list of the authors who have taken part in the physical-geographic regionalization of the Ukrainian SSR is shown on the summary map presented to the congress).

Because of early deadlines and the difference in the degree to which the

physical-geographic conditions of the Ukraine have been studied, the co-ordinating conference adopted a resolution to conduct the physical-geographic regionalization simultaneously from the higher to the lower taxonomic units and from the lower to the higher units, refining the general scheme of regionalization and the natural boundaries of all the taxonomic units.

Having generalized the available literary and cartographic materials on the study of the geologic-geomorphic, hydroclimatic, soil and geobotanic conditions, the special-purpose regionalization material and also certain experiments in the physical-geographic regionalization of the Ukraine, the Kiev University team worked out a scheme of physical-geographic regionalization of the Ukrainian SSR identifying physical-geographic countries, zones, subzones, oblasts and suboblasts. The scheme was adopted as a working basis for tying together the regionalization materials for the parts of the Ukraine. (V. P. Popov, A. I. Lan'ko, A. M. Marinich, O. V. Poryvkina, "A scheme of physical-geographic regionalization of the Ukrainian SSR," Nauchnyye doklady vysshey shkoly, geologo-geograficheskiye nauki. No.1, 1958). In February, 1959, a conference of the university teams summarized the results of the field work and refined the general scheme of regionalization of the Ukraine, and also distributed responsibilities among the authors for compiling a medium-scale summary map and the textual part of the physical-geographic regionalization of the Ukrainian SSR comprising 80 to 90 printed sheets. At this conference, the outline of the textual part was also agreed upon. It is proposed to complete the compilation of the map and the writing of the text in 1960. This will terminate the first stage of the work of physical-geographic regionalization.

The physical-geographic regionalization is being conducted on the basis of the landscape-genetic principle. It consists in fixing the boundaries of the natural complexes of different taxonomic and typologic significance and in determining their properties through a thorough study of the interrelations and interactions between the landscape-forming factors and the components of the geographic environment. Account is taken of the origin and natural historic development of the landscapes of a given territory, and of the effects produced on nature by the economic activity of society. F. Engels emphasized that "Interaction is the first thing that emerges before us when we view moving matter as a whole from the viewpoint of present-day natural science.... Thus natural science confirms... that interaction is the true causa finalis (the ultimate cause) of things" (F. Engels. The Dialectics of Nature, Gosizdat politicheskoy literatury. 1952, p. 183).

The main landscape-forming factors are:

1. Solar radiation, an important source of motion, the source of light and heat on the globe;
2. The lithosphere and the hydrosphere, on the surface of which the action of solar radiation and the interaction of exogenic and endogenic processes takes place;

3. The atmosphere, as the medium of the conveyance of heat and moisture from one place on the globe to another.

Interaction between these landscape-forming factors is effected through the basic physical-geographic processes: heat exchange, moisture exchange and the exchange of mineral and organic substances, which find their reflection in the radiation and heat balance, the water balance and the balance of mineral and organic substances. The interaction of the basic factors of landscape formation through these processes produces definite natural complexes and brings about the contemporaneous development of the components of the geographic envelope -- relief, climate, surface and underground waters, soil and plant cover, and animal life.

A substantial part of physical-geographic regionalization must be the compilation of qualitative and quantitative characterizations of the properties of the identified natural complexes.

In conducting physical-geographic regionalization it is necessary above all to ascertain the heat, water and geochemical balances and those components of the geographic envelope that reflect most pronouncedly the interaction of the basic factors of landscape formation, or which themselves change, in the process of development, the elements of the balances, causing a general rearrangement of the natural components.

The existence of natural complexes is an expression of the territorial differentiation of the objectively existing integrity of the geographic envelope, the structure of which is determined by the character of the interrelations between its components.

Hence, in identifying territorial units of any taxonomic degree it is necessary to analyze the interaction of all the basic landscape-forming factors and the components of the natural complexes.

The manifestation of interaction between the basic landscape-forming factors and the change in the properties of the geographic envelope are zonal or azonal in character. Hence, the system of taxonomic units of physical-geographic regionalization consists of two groups: the groups of zonal units -- belt, zone -- and the groups of azonal units -- country, province, oblast, rayon.

Starting with the general system of taxonomic units, the map of physical-geographic regionalization of the Ukrainian SSR shows zones, subzones, parts of countries, oblasts, suboblasts and rayons.

The Ukrainian SSR is situated in three physical-geographic countries. The main, or lowland, part of the Ukraine occupies the southwest of the Eastern European Plain; in the west of the Ukraine lie the Soviet Carpathians and in the extreme south the Crimean Mountains.

Every physical-geographic country is marked by a distinctive structure of the zonality of natural complexes resulting from its location within major geostructural units and its general geomorphic features, creating conditions for a definite atmospheric circulation and exchange of heat and moisture.

The boundaries between the physical-geographic countries in the Ukraine are comparatively clear. They are fixed by an analysis of the changes in the structure of the zonality of the natural complexes. The boundary between the lowland part of the Ukraine and the Carpathians runs approximately through Nemirov, Gorodok, Nikolayev, Khodorov, Galich, Otynya, Kolomyya, Snyatyn, Chernovtsy and Novoselitsa.

The northern boundary of the Crimean Mountains runs through the following populated places: Orlovka, Kol'chugino, Lenskoye, Novozhilovka, Zolotoye, Goncharovka, Blizhneye and north of Feodosiya.

The highest zonal physical-geographic unit is the belt governed by the radiation balance, the thermic conditions and the sharply different types of atmospheric circulation. This produces a distinctive relationship between heat and moisture, which determines the direction and intensity of the processes of weathering, soil formation, the biologic processes, etc. Belts differ in the duration of the period of intensive growth, the conditions of agricultural management and the specific combination of crops.

Almost the whole territory of the Ukraine lies in the temperate belt with the exception of the southern coast of the Crimea, which possesses some features of the subtropical belt.

Belts are divided into zones, characterized by distinctive landscape types of soils and vegetation, which originated under definite conditions of thermic regime and moisture. Consequently, the boundaries of zones are fixed by analyzing the soil and plant cover, taking into account the degree of moisture. A reliable index of the humidity of the territory is the relationship between the atmospheric precipitation and the evaporability (the Dokuchayev-Vysotskiy index). In application to the Ukrainian SSR, V. P. Popov has worked out a method of estimating the humidity of a territory as a coefficient representing the ratio of annual effective precipitation to conventional transpiration; (V. P. Popov, "The balance of moisture in the soil and the indices of the degree of dryness of the climate of the Ukrainian SSR," Naukovi zapiski Kiiv'skogo derzhavnogo universitetu, Vol. VII, No. 1, 1948).

The Northern Ukraine is occupied by the southwestern part of the zone of mixed forests. Its southern boundary is drawn according to the distribution of turf-podsol and swamp soils formed under conditions of excessive humidity under mixed forests on non-carbonate alluvial, water-and-glacial or glacial deposits.

The southern border runs approximately through the following points:

Rava-Russkaya, Kamenka-Bugskaya, Shepetovka, Polonnoye, Chudnov, Troyanov, Kornin, south of Byshev, Kiev, north of Bobrovitsa, Nezhin, Komarovka, Baturin, Krolevets and Luzhki. For a considerable distance, especially in the west, this boundary is fairly sharp and represents a projection of the heights of the right-bank Ukraine into the Poles'ye Lowland.

In the Ukrainian Poles'ye the annual radiation balance amounts to 30-32 kilocalories per sq. cm. The duration of the period of intensive growth is 90 to 105 days. The total annual precipitation is 550 to 645 mm. Evaporability does not exceed 400 to 450 mm. The moisture coefficient varies from 1.9 in the east to 2.6 and more in the west.

Among the other zones of the Ukraine, the Poles'ye stands out as having the largest water supply. The density of the water network is 0.17 to 0.175 km. per sq. km. on the Left Bank, 0.225 to 0.230 km. per sq. km. on the Right Bank. The mean annual runoff is about 3.5 liters per sec. per sq. km with a deviation in certain regions within the limits of 2.8 to 4.5 liters per second per sq. km. The zonal types of soils are turf-podsol and swampy, which occupy about 75% of the total area of the Poles'ye. A characteristic feature of the soil cover is the complex mosaic structure with frequent alternation of varieties of turf-podsol and swamp soils, with sprinklings of gray forest soils and even podsolized chernozems.

In the present plant cover considerable areas are occupied by forest, meadow and swamp vegetation. The plowlands constitute 35.1% of the total territory of the Poles'ye, forests 31.2%, hayfields 12.3%, pasture lands 6.2%. (The distribution of lands by zones is taken from the Atlas sil's'kogo gospodarstva Ukrains'koi RSR, Kiev, 1958).

The most substantial negative natural phenomena of a zonal character are the swampiness, the low natural fertility of the soils, the intensive development of the processes of infiltration, and the deflation of the sandy soils not anchored by vegetation, etc.

The main direction of the zonal measures to combat the negative natural phenomena and improve the productivity of the lands is toward a radical improvement of the hydrophysical properties of the sandy soils, drainage of swamps and regulation of the water regime of the swampy soils in conjunction with agro-reclamation and forest-cultivation measures, increasing of the fertility of all types and varieties of soils subjected to cultivation through the application of large quantities of organic and mineral fertilizers, and also the liming of acid soils.

On the light turf-podsol soils of the Poles'ye the main crop-rotation factors in the raising of the fertility are fallowlands manured with green lupine; and on the heavier soils, perennial grasses. Here a short crop rotation produces the greatest effect.

The forest-steppe zone forms 35% of the area of the Ukrainian SSR. Its

southern boundary is drawn by us along the northern line of distribution of ordinary chernozems formed under variherbaceous-fescuegrass-feathergrass steppes, and runs approximately as follows: south of Krasnyye Okny - Dolinskoye - Anan'yev - east of Lyubashevka - Krivoye Ozero - north of Ol'shanka - between Dobrovelichkovka and Peschanyy Brod - north of Kirovograd - Znamenka - north of Aleksandriya - south of Anufriyevka - south of Kremenchug - mouth of the Vorskla River - Krasnograd - Zmiyev - along the valley of the Northern Donets.

The annual radiation balance varies within the limits of 32 to 35 kilocalories per sq. cm. The length of the period with temperatures above 15° is 100 days in the west, increasing to 110 toward the east, and the southern forest-steppe everywhere has 120 days, with an annual above-10° temperature sum of as much as 2,800°. In keeping with the characteristics of the atmospheric circulation the moisture coefficient fluctuates within wide limits, from 1.3 in the east and south of the zone to 2.6 in its extreme western part.

The moister right-bank forest-steppe is characterized by a higher degree of leaching of the soils, the predominance of podsolized chernozems and gray forest soils, formed under broadleaf forests on carbonate loess rock. In the left-bank part and in the southern strip of the zone predominate typical low-humus chernozems, formed under steppe vegetation.

The unique conditions of the relief in the process of the lengthy development of the landscapes have contributed to the complication of the landscape structure, and they have masked the breakdown of the zone into subzones. However, in the grouping of the physical-geographic oblasts it is possible to note a subzonal arrangement.

The degree of development of the forest-steppe zone and the extent of change in the natural plant cover are very great. In the lands of the zone, tilled lands constitute 67.6%, hayfields 5.1%, pasture lands 4.2%, swamps 1.3%.

On the average for the zone, the forest cover is 11.3%, varying from 1 to 3% in the east and south of the zone to 30% in some western rayons.

Characteristic of the agriculture of the zone is the great proportion of sowings of winter wheat (23.0%), corn (10.1%), sugar beets (7.9%), constituting 85.7% of all sugar-beet sowings in the Ukrainian SSR.

The main process exerting a negative effect on agricultural management is erosion. Hence, it is necessary to apply a complex of anti-erosion measures: hydrotechnical, forest-reclamation and agrotechnical (soil-conserving crop rotations, correct cultivation of the soils, sowings of perennial grasses, etc.), in combination with general methods of raising the fertility of soils, and the application of organic and mineral fertilizers.

For the left-bank forest-steppe lowland the most important task is the improvement of drainage simultaneously with the accumulation and retention of moisture, to combat the salinification of the soils.

The steppe zone of the Ukraine is distinguished by the greatest heat resources, the longest period of active biologic processes and the least moisture. The annual radiation balance is 35 to 40 kilocalories per sq. cm. The period with mean daily air temperatures above 15° increases from 125 to 140 days. The annual sum of temperatures above 10° is 3,000 to 3,200°, 600 to 800° more than in the Poles'ye. The mean annual sum of precipitation diminishes from 500 mm. in the northern part to 300 - 350 mm. in the Black Sea region. But evaporability grows to 900 - 1000 mm. The moisture coefficient fluctuates between 1.2 and 0.8.

Under the territory's conditions of insufficient moisture, the drainage network is very poorly developed. The density of the river network diminishes from 0.1 to 0.05-0.08 km. per sq. km. The mean annual runoff does not exceed 0.5 liter-secs. per sq. km.

The typical soils are the ordinary and southern chernozems, which were formed under variherbaceous-fescuegrass-feathergrass or fescuegrass-feather-grass vegetation on heavy-loam loess. They occupy about 90% of all the area of the zone. On the coasts of the Black Sea and the Sea of Azov are chestnut soils, formed under sparse fescuegrass-feathergrass or fescuegrass-feathergrass-wormwood vegetation. Among the chestnut soils are solontsy (salt marshes with alkalis washed down into the underlying clay pan), which in the region around the Sivash constitute about 20% of the area.

In thermic regime, moisture, soil-and-plant cover and the conditions of agricultural production the steppe zone is divided into two subzones: a northern and a southern. The northern subzone is characterized by a period of intensive vegetation lasting 125 to 130 days, and by a moisture coefficient of 1.0 to 1.2. Predominant in the soil cover are ordinary chernozems, formed under variherbaceous-fescuegrass-wormwood vegetation. The southern zone is marked by a period of intensive vegetation lasting 130 to 140 days, and by a moisture coefficient of 0.8 to 0.1. Predominant in the soil cover are southern chernozems and chestnut soils. Before subjection to cultivation, the vegetation was represented by sparse fescuegrass-wormwood and gramineae-wormwood steppes.

The present distribution of land by subzones is characterized by the following data (in per cent):

Subzones	Tilled lands	Pasture lands	Hayfields	Ravine-head forests, strips of forest and forest plantings
Northern	72.5	11.6	1.5	2.5
Southern	68.8	15.5	1.4	1.5

The boundary between the subzones runs through the following populated places: north of Bolgrad-Novaya Ivanovka-Starokazach'ye-Razdel'naya - Berezovka - Veselinovoye - north of Novaya Odessa-Privol'noye-Shirokoye-Nikopol'- Kamyshevakha - Orekhov-Chernigovka- Andreyevka - northeast of Berdyansk.

The inadequate moisture of the territory, the frequent recurrence of droughts, dry winds and dust storms, the unfavorable hibernating conditions for winter sowings, the considerable salinity of the soils, especially in the southern subzone, are the chief negative natural phenomena of a zonal character. In the steppe zone the complex of all the agrotechnical, hydrotechnical and forest-cultivation measures for raising the productivity of the lands is reduced primarily to the struggle for moisture. Along with agrotechnical measures aimed at accumulating, conserving and economically expending moisture, irrigation is also of great significance. The southern steppe subzone is a territory of irrigation on the basis of water from the big rivers. The total area subject to irrigation in the prospective future amounts to about 3,600,000 hectares .(S. M. Perekhrest, Orosheniye na yuge Ukrainskoy SSR (Irrigation in the South of the Ukrainian SSR). Tekhnicheskaya informatsiya. Ukrgiprovodkhoz. Kiev, 1956).

Among other measures, great importance is attached to the planting of forest shelter belts, snow retention, reclamation of salinified soils and prevention of salinification under irrigation conditions.

The structure of the sown areas of the steppe zone is characterized by the large proportion of winter wheat and corn. Winter wheat occupies about 50% of the total area planted to grain crops, and corn as much as 30%. In the steppe zone are located about 77% of all sunflower sowings in the Ukraine.

The province is regarded as a part of a physical-geographic country within a zone and is identified by the degree of continentality in connection with the distance from the oceans and the differing character of the transformation of the air masses. This substantially affects the distribution and development of the natural and cultivated vegetation and causes noticeable intra-zonal differences in the physical-geographic processes.

In certain cases a province can be singled out on the basis of a distinctive history of landscapes. The identification of provinces is rationally done on the level of the regionalization of the entire European part of the USSR.

The identification of physical-geographic oblasts within zones and subzones as units of non-zonal significance is linked with the existence of comparatively large orographic elements, usually due to the geotectonic structure.

In distinguishing oblasts and suboblasts of mountainous countries the

significance of the geologic-geomorphic factors is still more evident. For example, in the Soviet Carpathians a definite physical-geographic oblast corresponds to each morphostructural oblast. (The Watershed-and-Headwater physical-geographic oblast corresponds to the Central Synclinal zone; the Poloninsko-Chernogorsk physical-geographic to the Inner Anticlinal zone). Of great importance in the analysis of mountainous oblasts is the relationship between the vertical zonal differences and the geomorphic characteristics of the territory, which produce the special structure of the types of terrain in a region.

In fixing the boundaries of an oblast account is taken of the geologic-geomorphic conditions that cause changes in the zonal relationships between heat, moisture and the balance of organic and mineral substances, as manifested in the intra-zonal differentiation of the soil and plant cover and in the conditions of crop growth.

Peculiar to each oblast is the distinctive character of the predominant physical-geographic processes. Thus, for example, on the dissected surface of the Dnieper Uplands, which are undergoing positive vertical movements, erosion processes occupy a leading place. The levelness and small degree of drainage, with epeirogenic subsidence in the area of the Dnieper terrace lowland, have created the premises for salinification processes.

In conjunction with the general trend of the physical-geographic processes one observes in the oblast a definite grouping of genetically related rayons with their characteristic types of terrain. In identifying the suboblasts, special significance is attached to the study of the properties of the Quaternary cover, due to the distinguishing features of the history of development of the landscapes in the Quaternary Period. The different lithologic composition of the Quaternary cover and its hydrophysical and chemical properties have major landscape-forming significance. Thus, the penetration of water-and-glacial sand deposits into the forest-steppe zone resulted in the development of landscapes of the Poles'ye type. On "islands" of loesslike deposits in the Poles'ye oblasts one observes a soil and plant cover of the forest-steppe type. In the oblast of the Zhitomir Poles'ye moraine and extra-moraine suboblasts are distinguished in the landscape. In other cases, certain differences in the general geotectonic structure have significance in the formation of suboblasts.

The boundaries of the physical-geographic oblasts and suboblasts in the lowland countries and still more in the mountainous countries are clear, as a rule. Usually they are due to sharp changes in the elevation of the territory, the degree of dissection of the relief and the character of the Quaternary cover, which determines the differentiation of the types and subtypes of soils.

The grouping of genetically unified physical-geographic rayons, based on their landscape structure, should be regarded as the most objective method of fixing the boundaries of physical-geographic oblasts.

The physical-geographic rayon is distinguished as a part of the oblast or suboblast on the basis of major local differences in the trend and intensity of the contemporaneous natural processes of erosion, accumulation, filtration, swamp formation, salinification, undermining and the biochemical processes that cause considerable local changes in the physico-chemical properties of the soils and the plant groupings. The boundaries of the rayons are determined by analyzing the landscape structure of the territory on the basis of the combination, recurrence and territorial relationship of the types of terrain and landscape units. By type of terrain we mean the combination of genetically interrelated landscape units that determine the distinctive character of the territory from the viewpoint of economic utilization and the ways of combating the local negative natural phenomena. The landscape unit (urochishche) is an elementary landscape complex, formed on a homogeneous lithogenic base under predominance of one of the local physical-geographic processes. Its contours correspond to a definite relief form (a loess ravine, a watershed loess depression, a lowland swamp on a moraine-and-outwash plain, a moraine ridge, etc.). In isolating landscape units a major role also belongs to man's economic activity.

The terrain types and the landscape units peculiar to them determine the internal content of the regional units. Every physical-geographic rayon is characterized by one or two basic types of terrain, which determine its chief natural properties, and by several secondary genetically related types and subtypes of terrain, which are limited in distribution. The identification of physical-geographic oblasts, suboblasts and rayons by analyzing the landscape structure of a territory was done by the teams of the Kiev, L'vov, Chernovtsy and, in part, the Khar'kov universities in the above-mentioned administrative oblasts.

The various university teams identified the oblasts, suboblasts and rayons by analyzing and comparing physical-geographic, geologic, geomorphic, climatic, soil and geobotanic data and schemes of special-purpose regionalization. In addition, a study was made of the morphologic-genetic structure of the geographic environment on typical key sections.

The physical-geographic oblasts, suboblasts and rayons are grouped quantitatively as follows:

Physical-geographic countries and zones	oblasts	Total suboblasts	rayons
Southwestern part of the Russian Plain	36	23	196
Zone of mixed forests (Ukrainian Poles'ye)	6	5	44
Forest-steppe zone	14	11	81
Steppe zone	15	7	71
Ciscarpathia, Soviet Carpathians and Transcarpathia	7	4	27
Mountain Crimea	1	3	9
Total	44	30	232

Every physical-geographic rayon possesses its own individual features with respect to natural conditions. Still, a comparative analysis of the landscape structure has shown that within each zone the physical-geographic rayons, even if located in different oblasts, have similar features depending on the origin, predominance and recurrence of a given type of terrain. This makes it possible to type rayons and to work out a unified program of measures for the rational utilization of lands for definite groups of rayons.

In the Ukrainian Poles'ye we can distinguish a group of Pripet and Dnieper-Desna rayons with a predominance of valley swamp-and-pinewoods and floodplain types of terrain, requiring complicated reclamation work of a hydrotechnical or forest-cultivation character as well as special agrotechnical measures. A large group of rayons is characterized by the predominance of watershed moraine-and-outwash types of terrain with turf-podsol clayey-loam and light-loam soils. In addition there are rayons with terrain types of a forest-steppe character.

In the forest-steppe zone, a similar landscape-typologic structure characterizes all the Dnieper rayons of the northern, central and southern forest-steppe oblasts of the Dnieper Lowland. In it occur different combinations of the predominant ravine-and-gully type of terrain having heavily eroded gray forest soils with hill-and-plains or plains-and-depression types of terrain having typical low-humus chernozems.

In the steppe zone we can distinguish the group of rayons of the Black Sea Lowland with a predominance of poorly drained plains-and-sinkhole types of terrain without runoff; the group of rayons of the Dnieper, Donets and Azov uplands, where the valley-and-gully type of terrain is combined with erosional-structural and watershed-monadnock types with eroded soils and gully-head tree groves; the rayons of the southern slopes of the Moldavian and Podolian uplands, and of the southwestern slopes of the Middle Russian Uplands, which are marked by valley-and-gully types of terrain on different lithogenic bases with eroded soils; and a group of maritime rayons possessing distinctive types of terrain genetically related to the action of the sea.

In various oblasts of the Soviet Carpathians we can distinguish rayons with a predominance of the poloninskiy type of terrain (remnants of old peneplain, situated in the subalpine zone); rayons with a predominance of the verkhovinskiy (from verkhovina "headwaters", or a place name) low-mountain and swell type of terrain; and rayons with mountain-valley-terrace type of terrain with fir-and-beech forests.

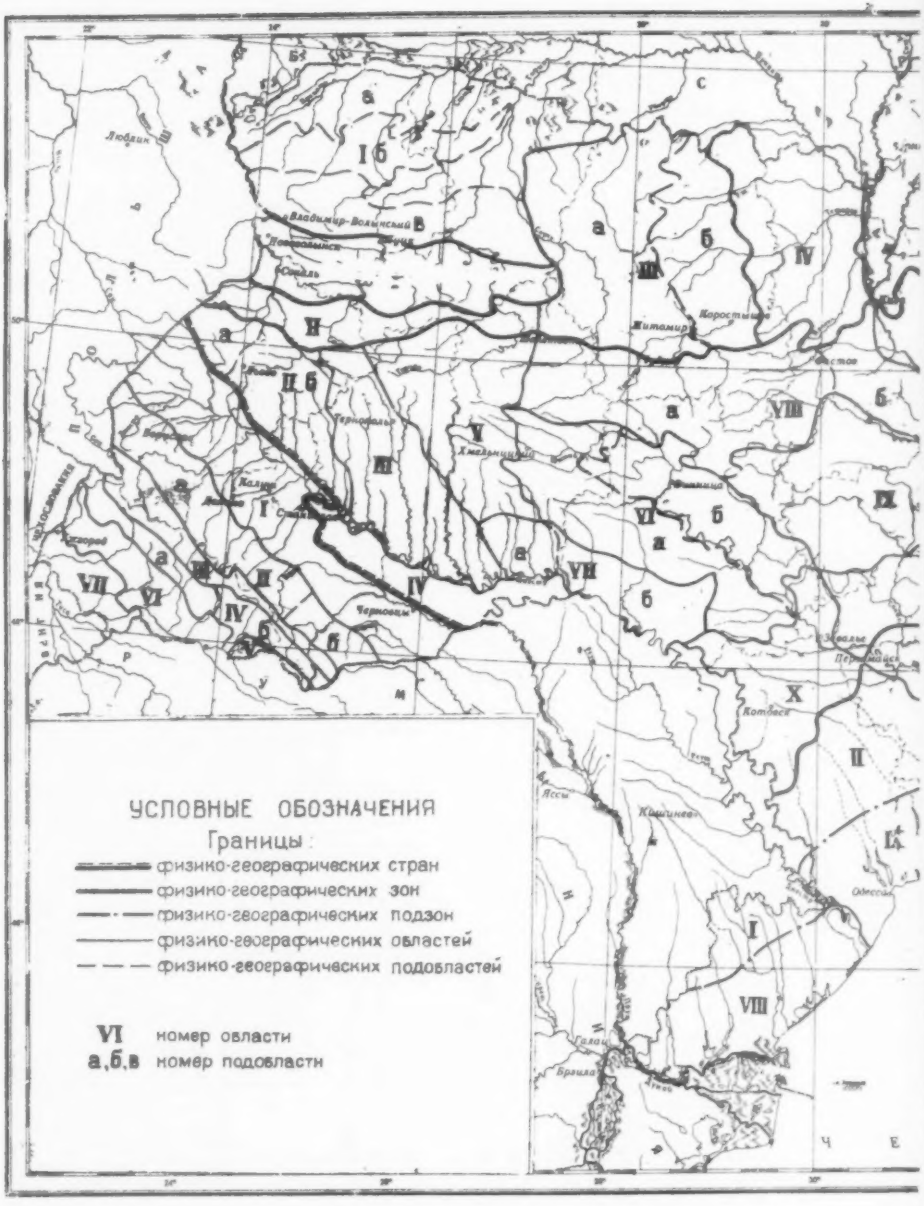
In the Mountain Crimea we can observe similar rayons with a predominance of the yayla (alpine meadow) type of terrain and a group of rayons characterized by a combination of unique southern-coast types of terrain with soil and plant cover of a subtropical character.

The differences in landscape structure of the separate rayons and their

DISTRIBUTION OF LAND TYPES BY REPRESENTATIVE PHYSICAL-GEOGRAPHIC RAYONS

Physical-geographic zones and representative rayons	Percentage of lands in total area of rayon						
	Plowlands	Hayfields	Communal pastures and other pasture lands	Forests, brush and forest plantings	Swamps	Sands	Ravines
1	2	3	4	5	6	7	8
Zone of mixed forests							
Dnieper-Desna sandy forest-swamp terrace rayon	21.8	15.8	6.7	46.9	6.2	3.1	0.6
Lyubech-Chernigov unforested watershed moraine-outwash rayon with "patches" of loesslike loams	69.7	4.5	7.6	9.3	0.8	0.8	0.4
Berezna-Mena slightly eroded watershed-terrace loess rayon with small distribution of valley-out-wash terrains	82.1	2.3	3.6	1.8	0.5	-	0.9

1	2	3	4	5	6	7	8
Forest-steppe zone							
Kanev-Rzhishchev erosional rayon with development of glaciotectonic dislocations	50.0	1.4	27.4	11.9	0.35	0.29	13.6
Kagarlyk-Grebenkovskiy watershed-plain forest-steppe rayon of Kiev loess plateau	78.5	1.8	14.5	0.6	0.9	0.06	2.1
Zgurovka-Yagotin poorly drained rayon of loess terrace plain with solod' and solonets chernozems	90.6	1.7	0.8	1.5	5.1	-	0.01
Steppe zone							
Dnieper Gornostayevka-Belozero ravine-and-gulch rayon with eroded southern chernozems	77.6	0.2	8.4	0.8	-	-	11.7
Dnieper-Molochansk (Veseloye) watershed plains-and-sinkhole rayon having no surface runoff, with southern chernozems intermingled with gley solodi	89.9	1.2	1.9	1.2	-	-	-



PHYSICAL-GEOGRAPHIC REGIONALIZATION OF THE UKRAINIAN SSR

ФИЗИКО-ГЕОГРАФИЧЕСКОЕ РАЙОНИРОВАНИЕ УКРАИНСКОЙ ССР
Р Н О М О Р
Legend
Boundaries of:
physical-geographic countries
physical-geographic zones
physical-geographic subzones
physical-geographic oblasts
physical geographic suboblast
VI number of oblast
a,b,c, number of suboblasts

analogs dictate the local characteristics of the measures for raising the productivity of the land. This fact must be taken into account in planning measures of a zonal character. This is evidenced by the present distribution of land types by physical-geographic rayons. Let us cite a few examples (Pages 44 and 45).

Experience in physical-geographic regionalization has shown that the most efficient method of investigation is the study and mapping of the natural complexes and the determination of their landscape-typology structure. This method makes it possible to create a scientific foundation for working out measures for the rational utilization of the natural complexes and contributes to the development of the theory of physical geography.

At this stage it is possible to go over from small-scale to medium-and large-scale regionalization of the Ukraine, especially in connection with the large-scale mapping of the soils of the kolkhoz and sovkhoz lands.

Here it is necessary to introduce more widely stationary or semi-stationary methods of investigating the contemporaneous physical-geographic processes. The performance of regionalization research requires further elaboration of landscape-science theory and, in particular, the classification of the natural complexes.

The accumulated working experience and the availability of factual material permit us to proceed to compile a landscape map of the Ukraine.

All our work must be directed toward fulfillment of the decisions of the 21st party congress regarding the development of the USSR national economy for 1959-65. Only the strengthening of the ties of geographic science with production will contribute to its further development.

PHYSICAL-GEOGRAPHIC COUNTRIES, ZONES AND OBLASTS OF THE UKRAINIAN SSR (Map on Pages 46 - 47)

The Southwest of the Russian Plain

Zone of mixed forests (Ukrainian Poles'ye)

I. Volhynian Poles'ye
   a) Upper Pripet swampy terrace suboblast
   b) Volhynian moraine-ridge suboblast
   c) Turiysk-Kostopol' denudation plain on a Cretaceous foundation
II. Little Poles'ye
III. Zhitomir Poles'ye
   a) Western Zhitomir moraineless suboblast
   b) Eastern Zhitomir moraine suboblast
IV. Kiev Poles'ye
V. Chernigov Poles'ye
VI. Novgorod-Severskiy Poles'ye

Forest-steppe zone

I. Forest-steppe oblast of the Volhynian uplands
II. Forest-steppe oblast of the Rostoch'ye and Opol'ye regions
  a) Rostoch'ye
  b) Opol'ye
III. Western Poles'ye forest-steppe oblast
IV. Prut-Dnieper karst forest-steppe oblast
V. Northern forest-steppe oblast of the Podolian uplands
VI. Vinnitsa forest-steppe oblast of the Podolian uplands
  a) Forest-steppe suboblast of the Middle Bug region
  b) Vinnitsa suboblast (Staroles'ye)
VII. Dniester-Podolian forest-steppe oblast
  a) Western Dniester suboblast
  b) Eastern Dniester suboblast
VIII. Northern forest-steppe oblast of the Dnieper uplands
  a) Watershed forest-steppe suboblast of the Dnieper uplands
  b) Suboblast of the Kiev Plateau
IX. Central forest-steppe oblast of the Dnieper uplands
X. Southern forest-steppe oblast of the Podolian uplands
XI. Southern forest-steppe oblast of the Dnieper uplands
XII. Forest-steppe oblast of the Dnieper terrace plain
XIII. Poltava-Rovno forest-steppe oblast of the Dnieper lowland plain
  a) Northern forest-steppe suboblast of the Dnieper lowland plain
  b) Southern forest-steppe suboblast of the Dnieper lowland plain
XIV. Sumy forest-steppe oblast of the western slopes of the Middle Russian uplands
XV. Khar'kov forest-steppe oblast of the western slopes of the Middle Russian uplands

Steppe zone
Northern steppe subzone

I. Steppe oblast of the southern slopes of the Moldavian uplands
II. Steppe oblast of the southern slopes of the Podolian uplands
III. Steppe oblast of the southern slopes of the Dnieper uplands
IV. Steppe oblast of the Dnieper Lowland
  a) Steppe suboblast of the Orel-Samara lowland plain
  b) Steppe suboblast of the Zaporozh'ye-Gulyay Pole lowland plain
V. Starobel'sk steppe oblast of the southern outliers of the Middle Russian uplands
  a) Donets-Oskol steppe suboblast
  b) Aydar steppe suboblast
VI. Donets physical-geographic oblast
VII. Steppe oblast of the Northeastern Azov region

Southern steppe subzone

VIII. Danube-Dniester steppe oblast of the Black Sea Lowland

IX. Dniester-Bug steppe oblast of the Black Sea Lowland
X. Bug-Dniester steppe oblast of the Black Sea Lowland
XI. Dnieper-Molochansk steppe oblast of the Black Sea Lowland
XII. Steppe oblast of the western slopes of the Azov uplands
XIII. Oblast of the Dnieper terrace-delta plain
XIV. Sivash-Azov steppe oblast
XV. Steppe oblast of the lowland Crimea
a) Steppe suboblast of the Tarkhankut folded uplift
b) Central suboblast of the Steppe Crimea
c) Steppe suboblast of the Kerch' Peninsula

Soviet Carpathians and Transcarpathia

I. Oblast of Carpathian Foreland
II. Oblast of the Inner Carpathians
a) Suboblast of the Skib Carpathians
b) Suboblast of the Pokut-Bukovina Carpathians
III. Watershed-and-headwater oblast
IV. Poloninsko-Chernogorskaya oblast
a) Suboblast of the Poloninskiye Carpathians
b) Chernogorskaya suboblast
V. Marmaros oblast
VI. Oblast of the Volcanic Carpathians and inter-mountain depressions
VII. Oblast of the Transcarpathian Plain

Crimean mountains

Crimean mountain oblast
a) Suboblast of the foothills
b) Suboblast of the Main Mountain Ridge
c) Suboblast of the southern coast of the Crimea

QUESTIONS OF THE GEOGRAPHIC STUDY AND ECONOMIC USE OF FORESTS

By P. V. Vasil'yev

Forests render a dual service to human society. On the one hand they are a source of every possible kind of material values - fuel, building materials, industrial raw materials and many by-products (pitch, bark, fruits, feed resources, game, etc.); and on the other, one of the most important factors of the geographic environment, exerting an immense influence upon the hydrological and climatic conditions, the soil-forming processes, the growth and yield of agricultural crops in adjoining fields, the health conditions of populated places and so forth.

In the present paper we intend to dwell upon three groups of questions connected with the characteristics of forests and the tasks of the rational utilization and renewal of forests: (1) general questions of the study of forests (forest science), (2) the improvement of the inventory and organization of forests, and (3) a more rational economic utilization of the country's forest resources and their renewal.

Although man has used all the useful properties of forests from the very first stages of his material culture, an objective scientific understanding and clarification of the significance of forests as an important geographic factor arose many centuries later. Together with the destructive social conditions of society in the past, this circumstance has undoubtedly been one of the most important causes of the destruction of vast expanses of forest in past epochs. One cannot but recall the well-known thought of F. Engels on this subject: "The people who rooted out the forests in Mesopotamia, Greece, Asia Minor and other places to get plowland never dreamt that they were thereby laying the ground for the present desolation of these countries, by depriving them of centers for the collection and conservation of moisture" (The Dialectics of Nature, 1947, Gospolitizdat, Moscow, p. 143).

Instructive in this respect in the history of Russian forestry were the forestry measures of Peter the Great. They started with a broad economic appraisal of the forests, especially along the rivers, for the development of shipbuilding, the construction of towns, and so forth. But we do not have a single document giving evidence that their water-conserving and protecting role was taken into account in those years.

An understanding of the protective and climatological role of forests began to be formed in Russia only in the middle of the last century because of the intensified removal of forests in the southern, western and central guberniyas and the consequent rapid shallowing of rivers and the intensification of aridity in deforested regions. It was in those years that steppe forest cultivation ceased to be a measure for the creation of local wood supplies and became principally a reclamation measure (V. Ye. Graff's plantings, creation of the Shatilovo Forest, and so forth).

However, the analysis and understanding of the forest's role in the geographic environment came still later, not until the end of the 19th century. The first scientific ideas in this direction were expressed by V. V. Dokuchayev. But a full-fledged theory concerning the forest as a biological geographic phenomenon was first worked out by G. F. Morozov at the beginning of the 20th century.

In our days Morozov's teachings have been widely developed in the well-known concept of the forest as a biogeocoenosis, worked out by Academician V. N. Sukachev and confirmed by experimental investigations of the Forest Institute of the Academy of Sciences of the USSR.

As Academician V. N. Sukachev points out, the forest must not be approached merely as an aggregate of plant associations, but must be regarded as an aggregate of forest biogeocoenoses consisting of a section of the earth's surface and of the interrelated and interacting plant and animal life, soil and atmosphere. Forest science, based on a biogeocoenotic understanding of the forest, presupposes a thorough study of the latter, an ascertainment of the interactions and mutual influences between all the components, and the discovery of the laws governing the exchange of matter and energy both within the individual components and between them and the environment. These laws must be ascertained and confirmed by experimental field investigations. The first practical generalization of the results of such investigations can be obtained from the work on forest typology.

As a result we possess the most thoroughly elaborated principles of the classification of forests.

In a brief paper it is not possible to dwell upon the characterization of the significance of a geographic and biogeocoenotic study of the forest. Still, as an example we shall give some data.

In 1838, at the instance of the Main Administration of Transportation and the Tver'Governorship, a commission of the Academy of Sciences was created to study the influence of the cutting down of forests upon the shallowing of rivers. In spite of the fact that K. M. Baehr and P. I. Köppen took part in it, the commission did not come forth with any definite opinion. As a result, the cutting down of riverside forests not only did not decrease but even increased because of the growing demand for wood. The consequences of this are still being felt today. According to the data systematized by us, the river banks in most of the river basins of the European part of the Union have less forest cover than the whole territory of the respective oblast (Table I).

Table I

Oblast, kray or republic	Number of rivers and tributaries inventoried	Their total length in km.	Average forest cover in per cent	
			River banks	Average for oblast
Moscow Oblast	26	2078	17.5	35.6
Kalinin Oblast	5	1400	11.2	24.7
Ryazan' Oblast	16	1803	10.0	18.0
Yaroslavl' Oblast	5	383	12.8	32.0
Mari ASSR	7	1046	18.0	50.7
Chuvash ASSR	9	900	22.1	31.4
Tatar ASSR	9	1220	11.9	16.6
Smolensk Oblast	9	1535	9.6	20.3
Belorussian SSR	7	2300	12.6	25.0

In the field of protective forest cultivation, the absence of experimental data on the water-regulating role of the forests contributed to the fact that many specialists, even at the beginning of the 20th century, following Academician T. N. Vysotskiy, supposed that "forests wet the mountains and dry the plains" and accordingly favored a limitation of protective steppe forest cultivation.

Integrated investigations of forests and forest environment in recent years have brought clarity into the field. The investigations made by A. A. Molchanov have disproved the erroneous formula about the desiccating role of the forest. They have not only made it possible to take into account the water-conserving and protecting role of forests in its general form, but have also afforded the possibility of regulating it in accordance with the conditions of the locality through changing the percentage of forest cover, the territorial distribution of forests, the age and species composition of the stands, etc. According to A. A. Molchanov's data, the runoff coefficient under various forest-vegetation conditions depends to a large degree upon the percentage of forest cover and varies as follows (Table 2):

Table 2

Average forest cover of locality in per cent

Zone	0	10	20	40	60	80	100
Conifer-broadleaf	0.75	0.40	0.23	0.18	0.17	0.16	0.15
Forest-steppe	0.65	0.25	0.14	0.09	0.07	0.07	0.05
Steppe	0.75	0.15	0.09	0.07	0.07	0.06	0.06

Interesting new data have been obtained in the field of the mutual influence of soil and forest vegetation. For example, S. V. Zonn's experimental work has shown that forest stands under the conditions of the forest-steppe and steppe zones do not podsolize the soil, as was supposed before, but, on the contrary, improve the properties of the soil, both physical and chemical. Substantial conclusions of practical significance have been obtained in the field of the interrelation between forest swamp, forest and steppe, and so on.

Investigations by Soviet scientists in the field under discussion have eliminated the age-old gap between the economic and the biogeographic study of forests. And this in turn has made it possible to promote forest science, regarded earlier as an applied science in forest organization and assessment, to a theoretical discipline for the management of the forest economy, scientific conduct of assessment, forest organization, conservation and protection of the forests, and so forth. For this reason it is strange to find the opinion that modern forest science is divorced from the practical tasks of forestry. The exponents of this opinion do not perceive the great transforming role of the foremost ideas and conclusions of modern forest science, which beneficially affect the theory and practice of forestry.

Let us take one of the basic tenets of the biogeocoenologic theory concerning the forest, which treats the forest as a unity of arboreal and herbaceous vegetation and animal life developing under conditions of continuous interaction between these components, as well as between them and the environment. This tenet, deriving from a consideration of the forest as a geographic phenomenon, not only broadens our knowledge of the nature of the forest, but also leads to a number of important organizational and economic conclusions. Chief of these is the possibility and necessity of organizing a diversified, integrated economy designed for the active renewal and utilization of all the components of the forest, that is, not only the wood, but also the feed resources, the animal life, the water-conserving and protecting properties, and so forth. Only on the basis of modern forest science and a thorough study and consideration of the characteristics of forest types is it possible to insure an expansion of the productivity of forest lands and the economic significance of the forest, as well as an improvement in the water-conserving and protecting significance and other useful properties of the forest.

Of course, the scientific tenets and conclusions of modern forest science still do not suffice to solve the practical tasks of forestry. Forest science faces many unsolved problems. The 1957 statement of the Academy of Sciences of the USSR entitled Voprosy Sovetskoy nauki (Problems of Soviet Science) in the section on "Questions of Forest Science" rightly points out that "the problem of forest science is a great theoretic, biological and physical-geographic problem requiring integrated treatment by the representatives of the various branches of the biological, geographic and forest sciences." Proceeding from this, the statement advances a list of questions and topics. Many of them have a broad geographic aspect.

One of the topics, for example, is the biogeocoenologic regionalization of the forest territories of the USSR with a compilation of regional descriptions of forest types with their characteristics and determinants. The results of this investigation may aid in the correct solution of the questions of regional specialization of the forest economy with respect to types of trees, forestry measures, and so forth.

An important task of forest science is the further study of the biological properties of woody plants, and, on this basis, of the interrelations between woody plants, and between them and the soil, water and animal life; of the effect of microorganisms on the forest, and so forth. Of great significance in connection with the tasks of improving the composition of the forests is the further study of the biology of the renewal, growth and development of the forest, the processes of the change in the species and dynamics of the forest coenoses.

But here arises another, more complex problem - the relationship between the economic utilization of forests and their agricultural and health significance. The solution of this problem also belongs to the tasks of modern forest science. The inability to evaluate a given role of the forest aggravates

the conflicts arising between the demands of the lumber industry and the water-conserving and protecting value of forests. This conflict stands out graphically in the forests of Group I, represented by a total area of 30 million hectares with a forest-covered area of 19.4 million ha. According to rough estimates, with an average yearly increase of 2.0 to 2.5 cu. m. per ha. the yearly output of lumber from these forests could, it would seem, be brought up to 40 million cu. m. Actually there were no economic cuttings in these forests for a long time, and although in the last few years forest-renewal cuttings of great economic significance have been made, these have amounted to only 16 million cu. m. The representatives of the industry usually demand an increase in the lumber output from these forests. The foresters, taking into account the protective significance of the forests, object to this and sometimes even demand a reduction of the cuttings. There are many such conflicts in the forests of the second group, too. Upon the proper solution of this problem also depend the degree to which the current wood requirements of the national economy are satisfied, the practical exploitation of the water-conserving and protecting role of the forests and the consideration of the interests of future generations.

The possibility of a scientific solution of this problem depends in turn upon how accurately the forests have been inventoried and how correctly the conditions and trend of the economy have been determined in organizing them.

The inventorying and organizing of forests are long-standing achievements of science and practice. The first decree on forest organization in Russia was issued in the eighteen forties. However, in pre-revolutionary times neither the theory nor the practice of forest organization was able to get beyond the bounds of a narrow-minded organization in the interests of insuring to the crown or forest owner a maximum of lumber income or, in the best case, a maximum of wood productivity from the forest. Although by 1913 protective forests had been set aside from the crown forests in a number of guberniyas, the inventorying and organizing of them had no specific character.

The division of the forests of the USSR into three groups of different economic significance and studies for the ascertainment of their water-conserving and protecting role created the conditions for working out and applying a broadly differentiated system of inventorying and organizing the forests to convert them into real means of improving the economy and raising their productivity.

At present we possess fairly accurate data of a surface assessment inventory and evaluation for the whole forest area of Groups I and II. This area amounts to 113 million hectares in the Goslesfond (State Forest Reserves) alone. Among the 82 million ha. of the forest-covered area of these forests there are 7.8million ha. of forests of the green zone, 5.9 million ha. of restricted belts along river, 0.3 million ha. of shelter belts along railroads, and so forth.

All these forests are organized by higher categories. But for the further improvement of the forest economy this no longer suffices even for forests of economic significance. In the regions of distribution of the forests of the second group (regions of the Center, West, South, Volga, a considerable part of the Urals), we now face the task of growing 2 to 3 cu. m. of wood where 1 to 2 cu. m. grew and was cut out, i.e., the task of absolutely compulsory expansion of the renewal of timber resources on the basis of improvement of the composition and a raising of the productivity and quality of the forests. For the solution of this task, data based on ordinary visual assessment of forests, however close they may seem to reality, are no longer adequate. Inadequate, too, are the existing classifications of forests by degree of actual or potential productivity. It is quite out of keeping with the demands for an expanded renewal of forests that forest-organizing projects have for some time lost the force of directives and now play essentially the role of little more than reference data. In all the branches of industry it has long since become an obligatory rule to use definite norms and assignments for the growth of the productivity of equipment, for the use of productive areas, raw materials, energy, and so forth, and in agriculture there is not a single kolkhoz that dispenses with norms and assignments for the raising of crop yields and the productivity of animal husbandry. Yet in the forest economy, strange as it may seem, we have thus far not used a single norm or control target determining the increase in growth, fullness and reserves of the forest, etc., for certain conditions and for a certain period, say, 10 years.

In 1956-58, on the initiative of the Forest Institute of the Academy of Sciences of the USSR, an attempt was made to work out a system of measures for raising the productivity of the forests in the regions of the Center, West, South and Volga for the period extending to 1965. On the basis of these proposals and recommendations, the local forestry organs worked out in 1958 a suitable plan, providing for a 10-12% rise in the productivity of USSR forests by 1965. But the practical realization of this plan was properly organized only in some republics and regions.

At present, in connection with the work on the long-range development of the forest economy, draft documents are again being prepared to implement control norms and targets for each forestry camp and forestry district calling for the improvement of the composition and the increasing of the productivity of forests for a ten-year period.

The change to this system will require the reorganization and introduction of a whole system of forestry measures and a change to improved methods of making a general inventory and assessment of forests. It is necessary to use widely the procedures of the so-called instrument assessment of forests, especially for inventorying the current growth. The practice of organizing the forests and then managing them with regard for the types of forest must become compulsory in the forests of the groups under discussion.

In spite of the fact that Groups I and II have long included forests set

aside for various specific purposes placing their economic role in second place (for example, the above-mentioned restricted strips along rivers, soil-conserving forests, etc.), and in spite of the availability of serious forest studies on them, the forest economy in them is often still conducted on the old pattern, without scientific norms determining the width of strips, the optimum age and species composition, the ages of cuttings, etc. There is not a single strip among the 6 million hectares of restricted strips along rivers that has been delimited on an objective scientific basis.

For this reason forestry workers are now faced with the complex task of creating a whole new section of modern forestry and forest organization devoted to questions of organization of the economy in forests having different degrees of protective significance in Groups I and II.

As to the forests of Group III, we are here faced with unsolved problems even as regards a general inventory of area and reserves. By the beginning of 1959 a total of 325 million hectares had been organized in the Goslesfond (State Forest Reserves), as well as 19.8 million hectares out of 39.2 million in the kolkhoz forests. Of the total organized area, the forests of Group III account for about 212 million ha., which amounts to a little more than 20 per cent of the entire area of the forests of Group III. But these forests, too, have been organized mostly by rough methods, by the lower categories. The entire remainder of the forests, including vast expanses to be developed in the course of the next 10 to 15 years, have not yet been included in the organization, and in fact have been inventoried only by aerial photo and aerial-visual surveys.

Of course, such an inventory is necessary and useful for a start. It considerably broadens and refines our knowledge of the country's forest resources. Thus, for example, it was still thought as recently as 1931 that the forest reserves in Eastern Siberia amounted to 21 billion cu. m.; by 1953 as a result of processing aerial-survey materials it was ascertained that the forest reserves there reach 30 billion cu. m., and at present they are thought to be almost 39 billion cu. m. As a result of such increases in precision the Soviet forest reserves have "grown" from 40 billion cu. m. in 1924 to 75 billion cu. m. in 1956. But the reserves established from aerial surveys are still only relatively precise; verification by ground-assessment methods introduces substantial corrections. But that is not the main point. From the air it is possible to inventory the forests and even combat forest fires and pests, but not to organize the forests or intensify the forest economy. Quite correct, therefore, is the plan for expanding the area of organized forests to 507 million ha. by 1965, including 483 million ha. in the Goslesfond. The forests of Group III will then be almost 40 per cent organized.

Inasmuch as the natural renewal of cuttings will continue to retain a considerable place in the forests of Group III, it is premature to speak here of targets and norms for raising the productivity of the forests, with the exception of certain micro-regions. Exceptionally urgent, on the other hand,

is the task of clearly delimiting on the maps and on the ground the forests and forest lands designated for different purposes.

For a long time already large deforested areas have developed around towns and industrial centers in the heavily forested regions of Siberia, as well as along the railroads and waterways, and these areas are growing from year to year. This cannot be tolerated. We must set aside and reserve forest tracts for future protective and other purposes around the new industrial centers and towns now being founded or to be founded. It is inadmissible that the enterprises, kolkhozes and population of the now wooded regions should be forced in 20 to 30 years to haul in wood from a distance of hundreds of kilometers, as has happened already in a number of regions of Siberia.

On the other hand, it is also important to set aside in advance forested areas marked for agricultural development. According to the existing plans for these purposes in Siberia and the Far East, not less than 9 to 10 million ha. are to be cleared of forest by 1975. For this reason, it is also important to make an advance study of the forests with respect to hydrology and set aside those that have significance for water conservation and shelter.

The opinion is often expressed that we are approaching a time when science and technology will be able to provide people with everything necessary without resorting to the blessings and useful properties of the forests, for the growing of which many decades are always required. For this opinion there are, at first sight, certain grounds. Indeed, the total volume of USSR industrial production had by 1958 increased 36 times over 1913, while logging had increased only 5.5 times. Coal production during the same period had grown almost 15 times, petroleum production 12 times, gas production 40 times, but logging only 3.4 times, the proportion of firewood in the country's fuel balance having dropped from 58.7% in 1913 to 10% in 1958. The production of such building materials as iron, cement, bricks and glass grew by 6 to 12 times, slate 350 times, but consumption of wood in construction only by 4 to 5 times. As a result, the average expenditure of wood per million rubles of construction work has declined throughout the country from 600-700 rubles to 400 rubles in the last few years alone.

If we turn to the sheltering role of the forest, here, too, it is possible to name not a few achievements seemingly relegating the role of forests to second place. We are building large reservoirs, irrigation and water-supply systems capable of furnishing water to hundreds of thousands of hectares of land deprived of water-conserving and field-sheltering forests. Scientists and engineers are working on the problems of a possible change in the courses of great rivers, the transfer of water from one basin to another, the irrigation of the Sahara, and so forth.

We have intentionally cited rather well known examples to cite in opposition some facts less well known to wide circles that give evidence

of the growing economic and geographic significance of forests. Wood is at present being crowded out of the balance of building materials and fuel. But, on the other hand, its significance as an industrial raw material is growing enormously, with an especially rapid expansion of the industrial consumption of wood as a chemical raw material for the production of paper, cardboard, artificial silk, wool, furfurol, alcohol, and so forth.

Instructive in this respect are the data of foreign countries with a highly developed lumber industry. In the United States during the last 35 years the volume of lumbering has been reduced by more than two times, but the production of plywood has increased by 40 times, and the production of paper and cardboard has risen from 6.7 million tons to 26 million tons. At present 93% of all wood logged in the United States undergoes industrial processing, 21% being chemical. In other countries the proportion of wood undergoing industrial processing is still higher: 30% in Finland, 42% in Sweden, 38% in Canada and 46% in Japan.

In the light of these indices it appears quite correct to confirm the statement encountered in the literature of the above-mentioned countries that "from the viewpoint of industry the age of wood is as much before us as behind us." The latest tendencies in the industrial consumption of wood are asserting themselves more and more in our country, too. With a logging growth of 5.5 times over 1913, plywood production in the USSR had grown by 9 times by 1958, and will grow by 16 times by 1965; paper, 11.4 and 18 times, respectively; cardboard 36 and 150 times. Fiberboard , alcohol, viscose rayon, etc., will be manufactured in large quantities.

However, in view of the extremely low level of development of these branches in the past, our industrial use of wood still remains insufficient. Thus, the proportion of wood destined for chemical processing does not exceed 5% for the time being. While in the United States 2 cu. m. of plywood, 4.6 tons of paper, 4.4 tons of cardboard and 0.5 fiberboards are manufactured per 100 cu. m. of lumber logged, in the USSR the corresponding figures are 0.3 cu. m., 0.6 tons, 0.2 tons and 0.05. Still farther behind are our norms of per capita consumption of these articles.

Under the seven-year plan and particularly in the general fifteen-year plan there will be a sharp increase in wood processing. It is estimated that to satisfy the wood requirements of the national economy and population under a present technology of wood processing and the existing consumption norms, the volume of lumber logged annually will have to grow to 700-750 million cu. m. by 1975 compared with 360-380 million cu. m. at present.

With a total Soviet forest land area totaling 1,131 billion hectares, a forest-covered area of 681 million ha., a total timber reserve of 79 billion cu. m. and a mature-timber estimate of more than 1.5 billion cu. m., this logging volume does not, at first sight, appear excessive. However, two important circumstances must be considered here. First, it is inadmissible that an extraordinarily large number of people should be engaged in the

lumber industry. Even now about 15% of all industrial workers are engaged in it, and with a growth of logging to 750 million cu. m., 20% will have to be assigned to it. Secondly, it is necessary to take into account the extreme irregularity of the geographic distribution of our forests and the great inconsistency between this distribution and the present geography of the industrial consumption of wood.

In the zone of the northern regions of Siberia and the East are concentrated 41% of all the reserves of mature forests in the USSR (22 billion cu. m.), but only 1% of the country's population. In the zone of little forested or unforested regions of the Center, South, West, Northwest, the Caucasus and Soviet Central Asia, where 85% of the whole population is concentrated (and consequently also the overwhelming part of industry and agriculture), we have only 4% of all timber reserves. In all the remaining regions (the lumber-surplus oblasts of the European North, the Urals, Siberia and the Far East), we have 55% of the wood reserves and 14% of the population. But even in this zone, with the gravitation of transportation toward the waterways (the Northern Dvina, Mezen', Pechora, Ob', Yenisey, Angara, Lena and Amur Rivers), a considerable part of the lumber production has an outlet to the North only, where consumption of wood is either entirely lacking or restricted to an insignificant volume. At the same time in the heavily forested regions of our country there are more than 350 million hectares of undeveloped and almost entirely unexploited forests (mostly overripe) dying for want of economic utilization, while in the regions of the Center, West, South and Volgaland the use of the very limited resources results in large overcutting.

According to the data of the head forester of the Main Inspectorate of Forest Economy of the Ministry of Agriculture USSR, D. T. Kovalin, the reserves of mature timber in the Center will be exhausted within the following periods if the present volumes of logging are maintained:

1.	Moscow Oblast	in 6 years
2.	Ryazan' Oblast	in 4 years
3.	Bryansk Oblast	in 7 years
4.	Kursk Oblast	in 5 years
5.	Lipetsk Oblast	in 4 years
6.	Tambov Oblast	in 5 years

After these periods the lumber consumers of these oblasts will be obliged either to procure wood even for minor needs from the heavily forested regions with hauls of thousands of kilometers or proceed to cut maturing and medium-aged stands, i.e., to start removing the forests and impair their hydroclimatic and sheltering role.

The processes of shallowing and drying up of rivers in these regions are generally known. Unless forest use is regulated, they will become still more intensified. The country is bearing and will bear immense losses from the intensification of the erosion processes on the deforested lands.

The areas of agricultural lands attacked by erosion in the Soviet Union amount to tens of millions of hectares. It should be noted that the unfavorable hydrologic phenomena caused by the destruction of forests are no longer confined to the territory of the European part of the USSR, but have penetrated deep into the until recently still heavily forested regions of Siberia.

For the foregoing reasons we are faced with the necessity of carrying out urgent measures for regulating forest use in the heavily forested regions of the country and discontinuing the overcuttings in the little forested regions, for raising the water-conserving and sheltering significance of the forest tracts and replanting forests in unforested regions while at the same time fully satisfying the requirements of the national economy for wood. How is this to be done?

It is necessary first of all to insure a rational integrated utilization of wood in all stages of logging, hauling and consumption, drawing into industrial production the now unused waste, which amounts to 150 million cu. m., as well as 50 million cu. m. of firewood and non-commercial wood. According to available estimates, if these resources are utilized to produce fiberboard, cardboard, etc., and a change is made to new progressive norms of wood consumption in industry, in the mines, in construction, and so forth, the country in 1975 can forego the logging of 400-420 million cu. m. This will make it possible to save immense tracts of forests in the European part of the USSR and billions of rubles of capital investment in logging.

Taking into account that the demand for lumber materials in the little forested regions will continue to be high and their delivery from the heavily forested regions will always be connected with difficulties and great expense, it is necessary in these regions to intensify sharply the work of raising the productivity of the forests and to reach a point where 2 to 4 cu. m. will simultaneously be growing for the future wherever 1 to 2 cu. m. are cut. In the regions with sufficient forest areas this task must be solved mainly by increasing the new growth, reserves and quality of the forests, and in the little forested regions also by a wide use for reforestation of lands unsuited for agriculture and by an increase in the forest cover, i.e., a wide development of forest cultivation. This is easy to understand if we take into account the immense scale of logging in the heavily forested regions, done largely without proper measures for the renewal of the cuttings, and the still greater reductions of the forest-covered areas as a result of fires, which still remain a scourge of our forest economy.

According to the official data of the forest-reserve inventory of the RSFSR as of January 1, 1956, on the territory of the forests of the North, the Urals, Siberia and the Far East (where the total volume of logging in 1957 amounted to 135 million cu. m., and will reach 300 to 320 million cu. m. in 1975) there are 93.5 million ha. of forest areas not covered by forest stands, 52 million ha. of these having been formed in

the last 10 years as a result of fires (42 million ha.) and the failure to renew cut-over areas (10 million ha.). Consequently, in these regions we are annually losing more than 5 million hectares of forest-covered area. This exceeds the forested area of many Western European countries.

According to the data of the inventory of the forest resources of Perm' Oblast, its forest-covered area has been reduced from 10,955,000 hectares in 1945 to 9,650,000 ha. as of January 1, 1956, i.e., by 1,000,000 hectares in 10 years.

The task of properly regulating the forest cover of the various regions and the geographic distribution of the forests in our country was posed in the fundamental law on forests adopted in 1918 and signed by V. I. Lenin. If it has thus far not been enforced, it must now be enforced with all the more insistence in our days of the construction of communism. The transfer of logging to regular logging organizations, now being effected in these regions, will make it possible to improve the whole organization for forest management.

An important place in the system of forestation work should be occupied by the forestation of river banks, the creation of shelter belts, green belts around towns, and so forth.

The question of renewing cut-over areas in the heavily forested regions deserves special attention. At present the annual cut-over area in these regions amounts to almost 2 million hectares. A considerable part of this area is being renewed only by promoting natural renewal. A part of the area is renewed without the participation of man, and here, as a rule, by the replacement of the valuable coniferous species by growths of aspen and birch, while a good part, probably 300,000 to 400,000 ha., is not being renewed at all. The time has now come to insure their artificial renewal, where necessary, along with measures for promoting the natural renewal. The overgrown cuts of former years must also be subjected to artificial afforestation. At the same time, it is necessary, in the north and northwest of the European part of the USSR, as well as in Western Siberia, to carry on extensive forest-drainage work, which will raise the productivity of the forests by 3 to 4 times.

The amalgamation of lumber camps and forest-management stations now being effected in the heavily forested regions will render it possible to make wide use of the available technology for forest-drainage and forest-cultivation work.

In both our heavily forested and our little forested regions the above-indicated principles of organization of an integrated, diversified economy, with utilization and renewal of all the values of the forest, are still being only weakly applied. Estimates for certain forestry districts of Voronezh Oblast and the Caucasus show that with proper management the so-called accessory use of the forest can produce an even greater effect than the

logging of timber. The principle of integrated economy in the forest must become obligatory for a considerable part of our forests under exploitation.

The successful solution of all these tasks, which have been or are being reflected in one way or another in the long-term plans for the development of the national economy, requires the organization of deeper and broader scientific investigations of a theoretical and practical character.

The investigations relating to the field of forest science, as well as to the questions of inventorying and organizing the forests, have already been mentioned above.

The central task of science in the field of forestry and the development of the forest economy is a further and more thorough elaboration of ways of raising the productivity of the forests and of the forest economy on the basis of known and available measures: introduction of quick-growing and economically valuable species, forest-drainage measures, improvement in the care of the forest, and so forth.

Inasmuch as the effectiveness of all these measures is connected with the characteristics of the geographic environment, it is very important to expand the work begun in the Forest Institute in developing a regional specialization of forest-economy measures, covering the whole forest zone drawn into economic life.

In the field of forest utilization the principal task of our time is, first, to create the scientific premises for multiplying the country's supply of articles and products made from wood, not through an increase in logging but through a better and fuller use of each cubic meter of cut timber; and, secondly, to create logging methods and further improve its techniques to insure, without great expenditures, the unconditional renewal of the forest on all cut-over areas and the possibility of subsequently obtaining a larger amount of high-grade wood per hectare.

Finally, the further improvement of forestry is connected with the necessity for a more profound treatment of the questions of forestry economics and the lumber industry, for a search for more correct systems of management and organization of the economy, for a wider use of the cost categories, for methods of better stimulating production workers, and so forth.

How important these tasks are is evidenced by the fact that at present about 15% of the country's industrial workers and more than 5% of the capital funds are engaged in all branches of forestry. But their share in the total production of industry does not exceed 3%.

Thus, the working out of the scientific foundations for the further improvement of forestry in the country now needs the participation of representatives of the most diverse branches of the physical-geographic, biological, economic and specialized forest sciences. Hence the importance of effective coordination and of a broad geographic approach to the problems of the study and utilization of forests.

THE RESERVES OF WILD GAME; THE DYNAMICS OF HUNTING AND ITS PROSPECTS

By S. V. Kirikov and Yu. A. Isakov

Game animals are divided into several groups. Of greatest significance for the national economy are the fur-bearing animals, hoofed animals and game birds (The chapters devoted to the fur-bearing and hoofed animals were written by S. V. Kirikov; the chapter on game birds, by Yu. A. Isakov. The concluding part, examining the measures necessary for the renewal and expansion of the reserves of game animals, was written jointly by the two authors).

For a clear idea of what must be done to conserve and restore the reserves of these animals, one needs to answer the following questions concerning both whole groups and certain most valuable types: What has been? What is? What can and must be?

Fur-bearing animals

The furs of wild animals have in relatively recent times occupied one of the most important places on both the foreign and the domestic market. The well-known work by G. Fletcher (1905) On the Russian State, first published in 1591, said the Russian Empire abounded in natural wealth, especially the furs of wild animals (sable, fox, squirrel, beaver, marten and muskrat).

In 1653, 23,160 sable, 14,400 marten, 11,840 mink, 11,520 ermine, 15,790 fox and 355,950 squirrel were shipped abroad through the port of Arkhangel'sk alone (Rodes, 1858).

Undoubtedly, the furs shipped through Arkhangel'sk constituted but a comparatively small part of the pelts obtained annually in the Muscovite State in the middle of the 17th century.

Now a serious competitor to "wild" pelts has appeared in the form of furs obtained from wild-animal farms. In the United States, for example, the value of fur articles from mink is now about 3/4 of that of all fur articles sold in that country (Kaplin, 1959).

But farms raise a small amount of those wild animals whose furs are fashionable at a given time and enjoy the greatest demand. The majority of animals are not raised and probably will not be raised (for economic considerations). Hence, the demand for wild-animal furs will continue to exist for a long time.

What is the situation with respect to the reserve of fur-bearing animals in the Soviet Union?

Excessive hunting, which has often assumed forms of outright plundering, the lack of attention given to the renewal of wild-animal reserves, forest fires, the removal of forests, epizootics and other unfavorable factors have caused the reserves of some of the most valuable fur-bearing animals to become scarce.

At the end of the last century and in the first three decades of the present this scarcity attained such proportions that it became necessary to adopt urgent government measures for the conservation of such animals as the beaver and for the renewal of the reserves of sable, muskrat, pine marten and other animals.

The past and present population of fur-bearing animals is given below for several valuable species characteristic of a given type of environment.

Sable. This forest species was distributed much more widely in the relatively recent past than now. In the 17th and 18th centuries the sable was still encountered far to the west of its present area and was caught in Lithuania, Belorussia, the Smolensk country and on the Kola Peninsula. But the main reserves of this species were concentrated chiefly in Siberia and the Far East.

How many sable were caught in Siberia shortly after its conquest, when its natural reserves had not yet been impaired, and when did sable hunting begin to decline?

In Western Siberia sable reserves had been considerably exhausted by the second half of the 17th century, and therefore information relating to the 1620's and 1630's should be used for that part of Siberia. For the Urals and the southwestern edge of Siberia it would be important to have earlier information, but almost none has been preserved.

In Eastern Siberia and the Far East, the intensified hunting for sable, both by the local population and by Russian hunters, began later. To estimate natural sable reserves in those parts of the country, later hunting data should be used.

According to the information found in the fur-tribute records, 29,138 sable were collected from fur tributaries in Western Siberia and the Urals in 1630 and taken through customs by trappers, hunters and traders. (For Tara Uyezd, the records for 1630 were not found in the archives; hence, the information for 1625 was used, and for Tomsk Uyezd the information for 1632. The statistical information relating to the 17th and beginning of the 18th centuries, when no source is indicated, is taken from the records of the Siberian Bureau at the Central State Archives of Old Documents.)

The hunting of sable to the extent done in the 1620's and 1630's proved excessive, and by the end of the 17th century it had declined by more than twice. (In 1698, 13,537 sable were caught). In the fur-tribute books of the period one often finds the notation: "And for sable any other wild animal was accepted, for there was no sable to be had." There is no precise

information about how many sable were caught in the past century in Western Siberia, the Altay or the Urals. It is known only that sable trapping had declined by the beginning of the present century. Only after several years of prohibition against sable hunting and after resettlement by man has the state of the sable reserves improved and sable trapping in recent years (1956-58) has approached the level of the end of the 17th century.

Eastern, Trans-Yenisey Siberia was still richer in sable than Western Siberia, but there, too, the waning of sable reserves proceeded rather swiftly.

In the Yenisey region of Siberia 116,183 sable were taken for tribute and brought through customs by hunters and traders in 1630; ten years later the sable catch had fallen to 74,986; in 1698 only 4,398 were caught, and the native population paid the fur tribute principally with furs other than sable. (In the 17th century there were three uyezds, Mangazey, Yenisey and Krasnoyarsk, on the territory of the Yenisey region of Siberia. The first of these occupied the basins of the Taz, the lower course of the Yenisey, the Nizhnyaya Tunguska, the right bank of the Podkamennaya Tunguska, the basins of the Khatanga and Anabar, and a small part of the lower course of the Vilyuy. In the last century Yenisey Guberniya was formed in place of these uyezds. The present Krasnoyarsk Kray is fairly similar in territory to the guberniya.)

Information on the number of sable caught in the past century is much scarcer. It is known that 21,200 were caught in Yenisey Guberniya in 1830 (Pestov, 1831).

In the Lena and Trans-Lena lands active hunting began to develop after 1640, when the Yakutsk Ostrog was converted into the government center of Yakutsk Uyezd. (This uyezd in the 17th century, in addition to present-day Yakutia, embraced the whole Okhotsk coast and a large part of the Bering Sea coast, with the exception of the Chukchi Peninsula.)

In Yakutsk Uyezd 20,388 sable were caught in 1660; ten years later (in 1670) the catch had risen to 31,674; but 38 years later (in 1708) the catch had declined to 8,774, that is by 3 1/2 times compared with 1670.

Sable trapping declined especially in the northern part of Yakutsk Uyezd. As early as 1698 officials reported from the Kolyma area that "there is no more sable hunting or trading."

In the 1820's the state of the sable reserves in Yakutia improved somewhat over the beginning of the 18th century. In Yakutsk Oblast, which occupied less territory than the Yakutsk Uyezd of the 17th century (the oblast included a territory rather similar to that of the present Yakut Republic, less the Okhotsk and Bering coasts), the yearly sable catch averaged 11,400 in 1825-30. (The largest number were caught in 1825 - 18,600, the smallest in 1830 - 6,000. (Central State Archives. Basnin Collection).

According to the 1917 census the sable catch in Yakutia amounted to about 3,000 pelts (Bakhrushin, 1955, p. 41). In the present Yakut Republic sable hunting has grown rapidly in the last few years and in 1958 about as many sable were caught as in the 1830's.

The following is known about the history of sable hunting in the Baykal region. In 1649, at a time when the sable reserves had not yet been exhausted, about 14,500 were caught in Ilim Uyezd (Sherstoboyev, 1949; (The Ilim Ostrog became the center of an independent uyezd in 1648). In 1685 the catch amounted to 3,546, but in 1698 only 20 sable were caught in this uyezd. In Irkutsk Uyezd, which was formed considerably later, 3,316 sable were caught at the end of the 17th century (1698), and in Nerchinsk Uyezd 2,120. By 1712 the sable catch in Nerchinsk Uyezd had dropped to 247 pelts.

On Kamchatka, where sable hunting began considerably later than in Siberia and where it did not assume devastating proportions, the state of the sable reserves was more favorable. In the first two decades of the 18th century not more than 3,000 sable per year were exported from Kamchatka. (In 1704, 1650 were exported, in 1713, 2414, in 1715, 2699 etc.). Sable still remained numerous in the 1840's when as many as 10,000 pelts a year were being caught (Sabaneyev, 1875).

In the first quarter of the twentieth century the sable reserves became so scanty and the area of their distribution so reduced that sable hunting had to be forbidden for some years. Several preserves were established (Barguzin, Kronotskiy, Altay and Sayan), the primary task of which was the restoration and augmentation of the sable reserves. Later, a great amount of work was undertaken in resettling sable in the places (in Siberia and the Urals) where they had lived earlier but had been exterminated entirely or become scarce. According to a communication from a staff member of the All-Union Scientific-Research Institute on Animal Raw Materials and Furs, V. L. Zaleker, over 15,000 sables of the most valuable stocks (Barguzin stock 70%, Yakut 25%, others 5%) had been released in this and other regions by March 5, 1959.

What are the practical conclusions to be drawn from the history of sable hunting?

As already mentioned, in the beginning of the 17th century, when the sable reserves were not exhausted, the biggest catch in Western Siberia and the Urals amounted to about 30,000. (A considerable part of the Altay was then outside the Russian State). Judging from the fact that the catch of 30,000 sable resulted in the extermination of the sable, the present catch should in the next 15 years not exceed by more than 20 to 50% the number of sable caught in 1958.

In the Yenisey region of Siberia (the present Krasnoyarsk Kray and the Tuva Autonomous Oblast), where a sable catch of 75,000 to 116,000 in

the 17th century (less Tuva, which at that time did not belong to the Russian State) proved fatal to the sable reserves, the catch in the next 15 years should not exceed by more than 20 to 40% the number gathered in 1958.

Proceeding from similar estimates, it must be acknowledged that in Yakutia the sable catch in the next 15 years may exceed the 1958 catch by 50 to 100%.

Of the past state of sable reserves and hunting in the Far East very little is known. Hence, proposals regarding the size of the possible catch are less well grounded than for Western and Eastern Siberia, and proceed principally from an analysis of the present catch.

Apparently in the next 15 years the sable take in the Far East and Kamchatka can be increased by about 20% over 1958.

Undoubtedly, the figures cited must be regarded as only a rough approximation and should be further refined on the basis of an inventory of the sable reserves and an analysis of the take during the last few years. Furthermore, it is necessary to look into the state of the natural conditions in the area of distribution of the sable. (Huge forest fires, for example, or epizootics can sharply diminish the sable population. In such cases the size of the proposed take must be greatly diminished.) The state of the sable reserves must be watched with special care on the northern edge of this area, where it has rapidly disappeared as a result of excessive hunting.

Proceeding from the fact that two or three centuries ago the sable was distributed westward as far as Lithuania, Belorussia and the Kola Peninsula, an experiment should be made and sables (Yakut or Barguzin) released in the tayga strip of European Russia (in Kostroma Oblast or the eastern part of Vologda Oblast) and the results of this resettlement studied.

Pine marten. This species has long been of great significance to Russian hunters. The early Russians paid tribute to Oleg and Igor' "in one black marten from each household." This rate of "a marten per household" persisted in the 15th century as a serf obligation in the Grand Duchy of Lithuania. Especially rich in marten were the forests along the Volga, as well as those of the southern and middle Urals Foreland, the Southern Urals and the western slope of the Middle Urals.

Both in the past and at present, the main marten population has been concentrated in Europe, not in Asia. Although the area of the pine marten (in the Soviet Union) is considerably smaller than the sable area, the difference in the catch of these two species has been small; around the beginning of the present century 10,000 to 20,000 fewer marten were being caught than sable (Turkin and Satunin, 1900). Now this gap has widened, and in 1956-58, 30,000 to 40,000 fewer marten than sable were caught.

As a result of overhunting, the reserves of pine marten had become exhausted by the beginning of the present century. In a number of oblasts a temporary prohibition was instituted against the catching of this species. As a result of the prohibition and reduction in the catch, the state of the pine-marten reserves improved during the Second World War.

Both earlier and now, the pine marten has most densely populated the forests of the Caucasus and the southern areas of the forest zone (the area of broadleaf and pine forests, the area of mixed conifer-and-broadleaf forests and the southern tayga). In the northern tayga and the forest-tundra its density is considerably lower.

Mature or medium-aged forest is indispensable for the existence of the pine marten; it avoids low forest growth. The southern areas of the forest zone and the forests found on the forest-steppe have largely been cut down or are being intensively cut over. Places favorable to the habitation of the pine marten are thus being reduced. For this reason there are no grounds for counting upon an increase in the catch of this species in the next 15 years. In all probability, the catch will have to be kept approximately within the same limits it has had in the last 3 to 5 years.

Squirrel. The squirrel has for a long time been caught in large numbers in Russia. As early as the 15th century (under Ivan III) squirrel skins were exported abroad. In the past century the squirrel occupied one of the chief places in the fur trade. In the middle of the 19th century 11 to 12 million squirrels were caught in a good year and 5 to 6 million in bad years (Silant'yev, 1898).

In the first decade of the twentieth century still more squirrels were caught: about 15 1/2 million a year (Silant'yev, 1914). During the period from 1922 to 1952, the biggest squirrel take fell in the first three five-year plans. At the beginning of the forties (Second World War) the squirrel take diminished sharply and has remained at that level until the present time.

What are the reasons for the reduction in the squirrel take? In European Russia the cutting down of the forests and the replacement of mature conifer forests and oak groves by birch, aspen and brush stands have resulted in a deterioration of the living conditions for the squirrel and therein may lie one of the chief causes of the diminution in its catch. In Siberia, the chief cause apparently is the decline in the number of squirrel hunters, the hunt for sable being more important.

The squirrel population, like that of other rodents, often undergoes sharp changes. They may be caused primarily by the size of the crop of the basic winter and fall food, the nuts of conifer trees. Also of great significance in the broadleaf and mixed conifer-and-broadleaf forests is the harvest of acorns and linden nuts. Epizootics and forest fires may also affect the size of the squirrel population.

It must always be borne in mind that squirrel hunting may be subject to sharp variations. The "Crop Service" conducted by the All-Union Scientific-Research Institute for Animal Raw Materials and Furs is helping to watch the yield of coniferous species and to a certain extent to notify the fur-collecting organizations of opportunities for catching squirrels in the coming hunting season.

Arctic fox. Catching the arctic fox has long been one of the chief occupations of the inhabitants of the tundra. A land-register book of the Pustozero and Ust'-Tsyl'ma Volost for 1575 says, for example, that the Pustozero Samoyeds had to pay two white arctic foxes per bow. In 1707 the tribute was increased to 3 arctic foxes per man. Beginning with the second half of the 17th century arctic-fox skins began to occupy a considerable place in the fur tribute paid by the Western Siberian tundra inhabitants. The Obdorsk Samoyeds, for example, paid 349 arctic foxes in 1660, 899 in 1671, 1186 in 1680 and 2205 in 1712.

In 1703 the tribute collectors of the Khantay area collected 698 arctic foxes. With increasing distance from the southern boundary of the tundra the arctic-fox share in the collection dropped sharply, but in certain years of the 17th and 18th centuries arctic foxes went deep into the forest zone and were caught all the way to the Turtas and Vas-Yugan Rivers.

In the twentieth century the arctic fox has occupied a conspicuous place in pelt collections. In 1956-58 the catch of arctic fox fluctuated from 11,000 to 19,000 in the European part of the Union and from 48,000 to 84,000 in the Asiatic part.

The value of the furs obtained from wild animals characteristic of the steppes and deserts is far smaller than that of the furs of forest animals.

Susliks and hamsters are caught in large quantities, but this indicates the unfavorable situation with respect to the fight against these agricultural pests. It would be much better if these animals did not have to be caught and exterminated. The suslik population (all species, with the exception of the sand suslik, whose skin has considerable value) may be judged from the procurement of these skins.

The figures are so striking that there is no need to give all of them; we may confine ourselves to information from certain oblasts and republics characteristic of various parts of the country (Table 1, p. 71).

But as late as 1926-30 only 7,300,000 susliks were caught throughout the Soviet Union.

The situation is undoubtedly serious and alarming, especially in the southeast. These figures show that the steppe pastures in the southeast have become essentially the domain of the susliks, and that a considerable part of the grain crop is also going to them.

Table 1. Number of suslik skins collected in 1956-58

Republic or oblast	1956	1957	1958
Moldavia	500,750	695,770	331,910
Ukraine	4,957,710	5,271,200	5,249,460
Orenburg Oblast	3,353,000	3,237,300	4,100,600
Saratov Oblast	7,508,000	6,807,400	7,930,236
Stalingrad Oblast	25,315,000	28,181,800	22,310,982
Rostov Oblast	9,887,000	12,203,800	13,276,693
Kazakhstan	2,961,570	3,680,620	5,105,890

It is urgently necessary to look into the causes of the catastrophic growth in the suslik population. Even now it is possible to state that one of them is the overgrazing of domestic cattle, the conversion of pasture lands into a cattle stamping ground, where susli ks find the most favorable conditions of existence.

In the present situation the catching of the polecat, an exterminator of the suslik, is clearly harmful. Polecats should not be exterminated, but protected. Yet they are continuing to be caught (Table 2).

Table 2. Number of polecats caught in 1956-58

Republic or oblast	1956	1957	1958
Ukraine	70	--	--
Orenburg Oblast	7,600	15,600	22,572
Saratov Oblast	3,840	5,300	6,132
Stalingrad Oblast	10,100	1,500	1,240
Rostov Oblast	1,100	--	--
Kazakhstan Oblast	49,900	34,160	25,540

Marmots. The state of affairs with regard to the reserves of steppe marmots is diametrically opposite to that observed in the case of susliks. Around the beginning of the present century 1,000,000 skins of marmots (European and Siberian bobac and the marmot proper of the mountain meadows and steppes) were collected (Turkin and Satunin, 1900). Now only a few small colonies of bobac remain in the Ukraine, and hunting them is forbidden. (Nevertheless, poachers still exterminate them, and fur-collecting agencies buy them up. In 1956 in the Ukraine buyers accepted 100 marmot furs, in 1957, 220 and in 1958, 90.)

In Kazakhstan the catch amounted to 42,000 in 1956, 55,700 in 1957 and 60,800 in 1958.

Rather large among the fur-bearing animals is the group closely connected with bodies of water and shoreside tree-and-bush or reed and bulrush growths.

Some of the species of this group content themselves with swamps. Of especially great significance in this group used to be the beaver.

Beaver furs (and later also the beaver tail) were valued very highly, and the trapping of this animal played a large role in the national economy for several centuries. About the past distribution of this species more is known than about any other kind of animal, since news about beaver hunts is found in many historical documents of the 15th to 18th centuries.

No information has been preserved about the number of beavers caught in European Russia. There is only fragmentary information for certain small districts.

From the Mogilev Volost, for example, 105 beavers were taken in 1523, and 180 some years later (Archeographic collection of documents relating to the history of northwestern Russia, III, 1867).

But regarding the number of beavers caught in Siberia and on the east slope of the Urals in the 17th and the beginning of the 18th century we possess precise and numerous pieces of information in the fur tribute books of the Siberian Bureau. For each of the Siberian uyezds several books relating to different decades have been examined. These data are collated in Table 3, p. 73).

The information on beaver catches given in the table relates to the time when the beaver reserves were not yet exhausted. Using these data, it is possible to establish where and how many beavers there were, and this in turn will aid in determining what places in Siberia should be stocked with beaver now.

In the tribute books of the Yakutsk Uyezd examined not a single mention of beavers was found. In the middle of the last century beaver and muskrat skins were sold in the Kolyma region, but all were brought by Chukchi, who received them from the Ekyrngauly, a people who lived on the northwest coast of Alaska (Argentov, 1857). Undoubtedly the beaver skins later sold at the Yakutsk fair were imported (probably also from America).

Nor were there any beaver in the part of Transbaykalia belonging to the Nerchinsk Uyezd. It is true that "beaver" is shown in the tribute data for Nerchinsk Uyezd in 1698-99, contained in the Russian Historical Library (vol. VIII, 1884) and, on the basis of this V. I. Skalon (1954) affirmed that beavers were caught in the Nerchinsk Uyezd in the 17th century. But upon checking this information against the original tribute books of the Siberian Bureau, it was found that not "bobry"(beavers), but "babry", that is tigers, were taken as fur tribute. The latter were caught now and then in the part of Nerchinsk Ostrog that gravitated toward Argun' Ostrog.

Why were beavers absent from the larger part of Eastern Siberia? The winters there are severe and have little snow, and therefore the streams

Table 3. Information about the number of beavers caught in Siberia by tributaries and Russian trappers in the 17th century and beginning of the 18th century

Uyezd	Largest quantity of beavers caught	Smallest quantity of beavers caught	Average for years investigated	Years for which tribute books were examined
Berezovo	257 (1630)	13 (1698)	85.7	1630,1650,1660, 1671,1680,1698, 1712
Verkhotur'ye	42 (1660)	6 (1710)	21	1630,1641,1660, 1681,1698,1710
Narym	219 (1630)	80 (1658)	132.7	1630,1658,1698
Surgut	277 (1630)	9 (1698)	87.5	1630,1650,1660, 1671,1680,1698
Pelym	6 (1630)	4 (1698)	5	1630, 1698
Ket'	62 (1630)	5 (1698)	24	1630, 1651,1698
Tura	40 (1630)	5 (1671)	17.8	1630,1650,1660, 1671,1698
Tyumen'	44 (1701)	9 (1650)	23.1	1625,1630,1650, 1698,1701,1705
Tobol	193 (1698)	31 (1707)	116.4	1629,1630,1650, 1691,1698,1700, 1707
Tara	534 (1698)	161 (1625)	305.7	1625,1642,1650, 1660,1661,1670, 1672,1680,1698, 1700,1707
Tomsk	233 (1698)	33 (1718)	122.4	1632,1651,1690, 1698,1718
Kuznetsk	151 (1698)	3 (1648)	51	1630,1648,1650, 1698,1705,1715
Mangazeya	135 (1661)	0 (1703)	61.3	1630,1640,1661, 1680,1698,1703
Yenisey	124 (1651)	3 (1698)	53.2	1630,1651,1674, 1698
Krasnoyarsk	94 (1698)	11 (1680)	45.2	1651,1673,1679, 1680,1689,1698
Yakutsk	not a single beaver			1660,1670,1673, 1698,1706,1708
Nerchinsk	" " "			1667,1698,1700, 1712

in many places freeze to the bottom and are covered with naledi (frozen sheets of extruded water). This phenomenon is especially widespread in the northeast of Siberia; it is also common in the south of Eastern Siberia, on the territory of the former Nerchinsk Uyezd. Existence of beaver on such rivers and streams is impossible.

In Western Siberia there are more favorable conditions for the life of the beaver, and they were not rare there. They were most numerous where rivers flow through swampy places (Tara, Tomsk, Narym and Surgut uyezds, and parts of Berezovo and Mangazeya uyezds). But one cannot help noting that even in Tara Uyezd, where most beavers have been caught, the number taken averaged about 300 a year, and only on rare occasions was more than 500.

In the literature (Skalon, 1951) the opinion has been expressed that in the past "the beaver was almost equal to the sable in importance" in the deliveries of Siberian furs. Study of the original archives shows that this opinion is erroneous. The share of the beaver has hardly been a hundredth of that of the sable in Siberia.

The largest reserves of beaver in the past, as at present, have been in European Russia, especially in the west - in Belorussia, the northern Ukraine, and the Smolensk country. This was well known in the 17th century; in his Brief Notice of Russian Commerce As It Was Conducted in 1674, Kil'burger wrote that beavers "belong to the wares that Russia herself does not have in sufficient quantity." (At that time all of Belorussia and the right-bank Ukraine belonged to the Polish state.) Large consignments of beaver pelts were long imported into the Muscovite State from Poland, even under Ivan III. Even in the middle of the 18th century, a considerable number of beaver pelts, down and tails came from Poland into Orenburg and Troitsk, where there was heavy trade with the Kazakhs and Central Asiatic peoples.

By the beginning of the present century the beaver was on the verge of complete extinction in Russia. Resolute measures were adopted to protect and restore it. The catching of beaver was forbidden everywhere; several preserves were established, one of whose chief tasks was to preserve and increase the beaver reserves (Berezina, Voronezh and Kondo-Sosva); the beaver began to be preserved in earnest (not just on paper). Later a great amount of work was done in propagating the beaver. From 1930 to 1958, 2800 beaver were resettled. (Communication from I. Ye. Kiris and I. G. Safonov, of the All-Union Scientific-Research Institute).

A study of the past distribution and number of beavers caught permits one to affirm that the larger part of the beaver population will still be found in the European part of the Soviet Union.

The beaver population in Western Siberia can and must be increased. But there are no grounds for counting upon the possibility of populating Eastern Siberia with beaver and creating large reserves of that animal there.

All the places suitable for the life of the beaver must be populated more rapidly. For this purpose, it is desirable to draw up as soon as possible a cadaster of lands suitable for this species. A detailed list of all the places where beavers lived formerly would probably be very useful in making up such a cadaster.

Hoofed Animals

This group of game animals has lost its former economic significance to a much greater degree than the fur-bearing animals. Wild hoofed animals have long since given way to domesticated ones.

Certain species (wild horse, urus) have been completely exterminated; others (aurochs, koulan)have survived in small numbers and are found chiefly in nature preserves. But certain species still have substantial significance even now; among them should be mentioned first of all the elk and the saiga.

Elk. As early as the 16th century the tanning of elk skins was an important branch of industry in the Moscow State (Fletcher, 1905). In the middle of the 18th century there was on the Klyaz'ma River, 30 versts from Moscow, a factory where elk skins were tanned to supply the army.

To understand the present state of elk reserves one must ascertain the changes in the distribution of this species during the last several centuries. The most detailed and complete information about these changes is available for European Russia. At the beginning and in the middle of the 17th century many elk ranged through the district around Moscow and the Smolensk country (Margeret's Notes, 1832; History of Moscow, 1952). For some decades before then, at the time of Ivan the Terrible's campaign against Kazan', there were so many elk in the Murom forests that "they would come to slaughter as if of their own accord" (Tsarstvennaya Kniga, 1769).

But in the 18th century a sharp diminution in the number of elk was noted both in the forest and in the forest-steppe guberniyas of European Russia. For this reason, an ukase in 1740 prohibited elk hunting for ten years. In the Baltic countries and in the Novgorod guberniya hunting was forbidden as early as the 1730's. The raw material for the "elk factory" on the Klyaz'ma came chiefly from Siberia. In the 1770's and 1780's elk were very rare in Smolensk, Tambov and Penza guberniyas. The Kerensk (now Bednodem'yansk) governor's office reported the elk as being the rarest and most "curious" animal (Ts GADA, F. Pravit. Senata, Book 5560, p. 298). In the 18th century the elk also disappeared from the Carpathian foothill forests.

What is the cause of the sharp reduction in the number of elk in the 18th century?

It is known that in the Baltic countries many elk perished in 1752, having been infected with a plague from cattle (Fischer, 1778;Middendorf,

1769). Since at that time large consignments of cattle were being driven to Moscow, St. Petersburg and Riga from the southern and eastern guberniyas and the roads over which they were driven passed through many places, the possibility of infection of elk from cattle was great; epizootics were common in cattle at that time, and the reports of governmental officials were full of communications about cattle murrains.

In all probability the elk perished from this cause not only in the Baltic countries, but also in other places.

A second cause of the sharp reduction in the number of elk was over-hunting.

An ukase of 1740 said hunters were killing a multitude of elk and expressed the fear that elk "will in time become almost entirely extirpated" (Vnutrennyy byt Russkogo gosudarstva..., 1880, p. 299).

A perceptible growth in the number of elk was noted only in the middle of the 19th century, when they began to appear in places where there had been none for a long time and became more numerous where there had been few.

In the forests along the Sheksna, elk were first noticed around 1852 after a long absence; in Korchev uyezd (Tver' gub.) in 1855; in Vladimir guberniya in 1845-53; in the Ryazan' Meshchera at the beginning of the 1860's; in Moscow guberniya a perceptible increase in the number of elk began in 1857, and in Nizhniy Novgorod guberniya in 1860.

At the end of the last and the first quarter of the 20th century the number of elk again dropped sharply and they disappeared from many places in European Russia, while in other regions they survived only as a rarity. A new wave of resettlement of the elk began about the beginning of the 1930's and embraced a large territory, from Belorussia to Kazakhstan. It is interesting to note that the resettlement proceeded both southward and northward; the elk spread widely not only along the southern strip of the forest zone and forest-steppe, but also over the forest-tundra; they also penetrated through riverside and gulch-head forests and willow groves into the zone of steppes and tundras.

According to 1954 inventory data, about 300,000 elk were counted in the RSFSR (Isayev, 1959). Analysis of the inventory data shows that the lowest elk population density is indicated for Yakutia and Krasnoyarsk Kray (1 elk per 5,000 hectares).

This recalls the work of T. Miller (1756), which pointed out 200 years ago that in Eastern Siberia the density of the elk population was much lower than in Western Siberia. Miller was inclined to explain this peculiarity by the fact that elk prefer to live in lowland forests rather than in mountain forests. It is more likely, however, that the clear larch tayga of Eastern Siberia is less suitable for the existence of the elk than the mixed conifer-and-broadleaf tayga and the swampy urmany (fir-and-spruce forests) of Western Siberia.

It should also be noted that the greatest density of the elk population has proved to be in populous oblasts situated on the southern edge of the forest zone or in the forest-steppe, such as Tula, Moscow, Kuybyshev, Tambov and others. This is undoubtedly to be explained by the fact that the protection of the elk has been satisfactorily enforced here, and poaching has not assumed such proportions as in a number of other oblasts, for example in Western Siberia (Laptev, 1958).

In localities with a dense elk population a gap has begun to develop between the number of elk and the supplies of winter feed. On this account, the elk have begun to damage young plantings of pine and the natural pine saplings. Hence, it is necessary to work out norms of admissible density of elk population and measures to provide additional forage for them and keep them away from pine plantings.

Saiga. This antelope is the most numerous of the hoofed animals of the Soviet Union. In Kazakhstan alone the saiga population in 1954 was estimated at 900,000 head (Sludskiy, 1955). There are also large saiga herds in Stavropol' kray, Astrakhan' oblast, in the south of Stalingrad oblast and in the Kalmyk ASSR. In the opinion of Sludskiy (1959) it is now possible to engage in professional hunting for the saiga in nine oblasts of Kazakhstan and catch not less than 280,000 head annually.

The same author (1959) raises the important question of the regulation of saiga hunting. In Kazakhstan hunting licenses have been issued to everyone who wanted them. As a result, instead of regularly organized hunting, there has been a wholesale extermination of the saiga.

Game Birds

In terms of reserves and the variety of valuable species of game birds the USSR holds one of the first places in the world. Unfortunately, thus far no inventory has been taken of their numbers over considerable areas, nor have organized collections (zagotovki) of wildfowl ever embraced the whole territory of the country. Neither has any complete record been kept of the amount of wildfowl caught by hunters. Hence it is very hard to give sufficiently clear indices of the present state of the game reserves and possibilities. To evaluate either one, use has to be made of a compilation of incomplete and non-uniform data.

The centralized game-bird collections in the years of greatest development (1931-33) yielded up to 11 million wood and water fowl. In terms of weight this amounted to at least 8,000 tons of meat, valuable for its flavor and nutritive properties. However, even in those years the collecting system did not embrace more than 50% of the territory of the main game regions, so that only an insignificant part of the catch taken by hunters came to the collecting stations. Hazel grouse finds the readiest sale among all the species of wildfowl, but only 12 per cent of the fowl reaches the collecting stations (according to the Arctic census of 1927-28). The amount of

waterfowl brought on the national market is immeasurably smaller; in many oblasts almost the whole production is consumed locally. In densely populated non-hunting oblasts the latter is true of all kinds of feathered wildfowl because amateur sportsmen constitute the main hunting contingent. Taking these circumstances into account, it may be assumed that the total of game birds caught on the territory of the USSR is 5 or rather 10 times greater than the earlier named figure for government collections and reaches 100 million a year, furnishing the population with as much as 50,000 to 80,000 tons of high-grade meat. The great economic value of the produce obtained from the hunting of wildfowl and the significance of hunting as a recreational sport, in which several million persons engage, cause one to pay attention to the question of conserving and restoring this type of animal resource.

To evaluate the degree of utilization of wildfowl by professional hunters and to determine the possibilities of further development, it is necessary to get an idea of the present state and distribution of the reserves. For this purpose, the types of game birds may be conveniently divided into: wood game (Galliformes), steppe game (great and little bustard), waterfowl (duck, goose, swan and coot) and sea fowl (murre and eider duck).

In the government collections, wood fowl occupies first place, which may be explained by the confinement of the main hunting season to the cold period of the year, the high flavor qualities of the meat of some species, the demand on foreign markets, and so forth. In the years before the First World War (1904-13) the average figure for collections of this group of fowl amounted to about 6,473,000; in 1931 the collecting bases received 4,755,000, but thereafter the volume of collections dropped by at least 10 times, and in 1955-56 only 458,400 were collected. The causes of such a heavy reduction in the volume of collections are discussed below.

The hazel grouse occupies first place among the gallinaceous birds. In pre-revolutionary times it accounted for 82.6% of the total amount of wildfowl shipped abroad and to the markets of big cities. The average yearly catch of this bird exceeded 5 million. In 1928-32 the Leningrad export base received annually 100,000 to 700,000 birds of this species, but in 1954-55 only 123,000 were collected throughout the country.

The hazel grouse inhabits the coniferous and mixed forests of the USSR. The cutting down of the forests has had an unfavorable effect on its population so that in the central oblasts of the European part of the USSR it has ceased to be a game bird. At the end of the 19th century and the beginning of the 20th the hazel grouse was hunted professionaly on the territory of Simbirsk, Yaroslavl', Kostroma (as many as 88,000) and Kazan' guberniyas (as many as 35,000). Professional hunting in Vyatka gub. yielded about 336,000, in Vologda gub. 458,000, and so forth. At present, in the European North, the hazel grouse is collected only in Arkhangel'sk obl. and the Komi ASSR, and even there only in negligible quantities, totaling

less than 45,000. The drop in the volume of professional hunting can be only partly attributed to a reduction in the reserves of this species in the south of the forest zone. The hazel grouse in many rayons of Vologda, Arkhangel'sk and other oblasts, in the Urals and Western Siberia reach densities suitable for professional hunting but the reserves are greatly underexploited. With proper organization the volume of collections of this species could be raised to several million without detriment to the state of the reserves.

The capercaillie has had and continues to have a lesser role in the collections. The quantity of birds received by the Leningrad base in 1928-32 did not exceed 30,800 a year. The meat of the capercaillie is rather coarse and has never enjoyed great demand on foreign markets. The main value of this bird lies in its being a fine object for sportsmen.

The area of distribution of the capercaillie embraces the whole zone of coniferous and mixed forests. In the recent past the capercaillie was encountered also in the larger forest areas within the forest-steppe. For example, at the beginning of the 19th century they still inhabited the forests of Khar'kov gub., and were found as far southward as Voronezh, and along the Volga uplands almost as far as Kamyshin (Kirikov, 1959). During the last 100 years, as a result of intensive cutting of the forests, their boundary of distribution, in the European part of the USSR, has shifted considerably northward; they have become rare everywhere in the central oblasts. The total number of capercaillie in Belorussia in 1956-57 was estimated at 3,200; the reserves there do not exceed on the average 0.6 of a bird per 1,000 hectares of forest-covered area, and only in Vitebsk obl. do they rise to 1.0 (Dolbik, 1959). In the Mordva and Tatar ASSR's and in Kuybyshev and Tambov obls. the density of capercaillie is less than 1.0 per 1,000 ha., and in Yaroslavl' and Vladimir obls. 3.1 - 3.3. On about 11,000 hectares of the state forests (55% of their whole area), in the Central oblasts of the RSFSR, only about 40,000 to 50,000 capercaillie survived in 1958 (Priklonskiy, 1959). According to data from a questionnaire survey made by V. I. Osmolovskaya, the number of capercaillie in the north of the European part of the USSR likewise nowhere reaches professional-hunting density. Almost everywhere on the western side of the Urals a heavy drop in the number of capercaillie has been noted in recent years, especially in the more populated rayons, In the Urals Foreland, in the Center Urals and the Trans-Urals (from Cherdyn' to Nizhnyaya Tura), the number is somewhat higher, amounting here to 4.3 to 6.0 birds per 1,000 ha. Hunters know of 10 to 15 mating places each, at which as many as 20 to 30 cocks congregate. The abundance of capercaillie attains professional-hunting densities in the less populated rayons of the northern Urals (Ivdel', etc.). The stock of capercaillie is best preserved in the tayga along the Irtysh, to the north of Tobol'sk (averaging 6.0 per 1,000 ha.), along the lower course of the Ob' and in Krasnoyarsk kray. Fairly abundant is the rock capercaillie inhabiting the tayga of Eastern Siberia, Transbaykalia and the Amur region, where its density, according to 1958 data, averages 4.5 to 6.5 birds per 1,000 ha. (V. I. Osmolovskaya).

The main cause of the sharp reduction in the number of capercaillie throughout the European part of the USSR is the cutting of forests over large areas. This destroys the mating places visited by the birds year after year. The area of land occupied by mating places amounts to less than 2.5% of the total forest area, so that its withdrawal from economic circulation to maintain the stock of capercaillie cannot cause any economic loss. In a number of oblasts the numerical strength of these birds is being reduced in forest tracts where the pitch pine is tapped. The pitch gatherers, going from tree to tree, flush the hatching females and often ruin their nests. The reduction in the numerical strength of capercaillie and quail due to this cause is especially evident in Vologda and Kostroma oblasts, which possess great expanses of pine forest (according to V. I. Osmolovskaya's data). Finally, a third and no less important cause is the reckless hunting in a number of the central oblasts.

The black grouse occupies a prominent place in present collections of wildfowl as it has in the past. In 1904-13 the quantity of birds shipped to trade posts averaged 510,800 a year. In 1928-32, 260,000 to 412,000 came to the Leningrad base per year, but in 1954-55 only 62,000 black grouse were collected. Such a sharp reduction in the volume of collections does not correspond at all to the state of the numerical strength of this species. Black grouse are widely distributed over the territory of the USSR; they inhabit the whole forest zone as far as its northern margins, and in the south they are common in the forest-steppe. The cultivation of the virgin lands and the cutting of forests in the forest-steppe oblasts of the European part of the USSR have considerably reduced the stock of this species there. An opposite effect is being produced by the intensive cutting of forests in conifer forests, as, for example, in the north of Kostroma oblast. These cuttings result in the growth of aspen and birch over large areas, which improves the living conditions for grouse and contributes to an increase in their numbers.

Black grouse are especially abundant in Bashkiria, in the Central Urals (Irbit and other rayons) and in the Trans-Urals. The mean density of population there is 30 to 40 birds per 1,000 ha.; as many as 100 cocks congregate at the mating places, and in winter they gather in large flocks and serve as an object for professional hunting. Still higher is the density of the black-grouse population in the south of Tyumen' and Omsk oblasts, the central rayons of Tomsk obl., the foothills of the Altay, the Kazakhstan forest-steppe and southern Buryatia. The great reduction in the number of black grouse in the middle zone of the European part of the USSR and in some places of southern Siberia is due not so much to changes in the natural conditions as to reckless hunting.

The ptarmigan has substantial professional-hunting significance. Its numerical strength is highest in the southern subzones of the tundra and at the northern limits of the tayga, where patches of woods alternate with tracts of moss swamps. In the tayga the ptarmigan are not very numerous, but they are very abundant in the forest-steppe of Siberia and Kazakhstan.

Professional hunting is done on a large scale in a number of rayons. Thus, for example, the Ust'-Usa cannery, in the northeast of the Komi ASSR, has for a number of years used the meat of the ptarmigan, processing 60,000 of these birds in 1928-29. The total volume of ptarmigan collections in the former Pechora kray reached about 700,000 in the same years (Solov'yev, 1930). At the beginning of the 18th century the ptarmigan was widespread in the European forest-steppe (Kirikov, 1959), but by now it has disappeared from this territory and is practically absent south of Moscow. Beyond the Urals the number of ptarmigan is still high. However, here too the regions that are of professional-hunting importance do not form a continuous zone, but are scattered among the forest-steppe and along the southern border of the forest zone. The causes of the reduction in the numerical strength of the ptarmigan in the south are the cutting down of the forests, the draining of swamps and immoderate hunting.

The numerical state of the gray partridge is very unfavorable. This valuable game bird is peculiar to the steppe and forest-steppe zone, hence, unlike most of the other gallinaceous species, its area is not being reduced as the forests are cut down and the plowland area increased, but is expanding northward. At the end of the 19th century the quantity of these birds had grown in Yaroslavl' (Sabaneyev, 1868) and Novgorod guberniyas, and in the 20th century they settled in the southern rayons of Arkhangel'sk obl., Karelia and the Komi ASSR. However, at the same time there was a considerable reduction in the partridge population density in the main regions of distribution of this species, in the forest-steppe and the south of the forest zone of the European part of the USSR and Western Siberia. In the recent past gray partridges were still caught here by the tens of thousands. In the Perm' guberniya alone the catch was 10,000 to 25,000 (Sabaneyev, 1872); everywhere in the south of the Ukraine, Rostov oblast and the Northern Caucasus partridges were the main object of hunting for sport, and in the Trans-Urals and Western Siberia they were hunted by professionals. At present, on the territory of Tula and adjacent oblasts (even in organized hunting districts) the density of the gray-partridge population nowhere exceeds 6 to 8 per 1,000 ha., and even in Rostov obl. it does not rise above 10 (according to V. I. Osmolovskaya).

Only here and there in Western Siberia is their number still of professional-hunting density. How negligible the above indices of the population density are may be judged from the fact that in Czechoslovakia, in an area constituting about 30% of the whole territory of that country, the number of partridges is 200 to 400 birds per 1,000 ha., and in certain regions exceeds 800 for the same area (Lesnicky a myslivecky atlas, 1955). This permits 250 birds to be shot each year on each square kilometer of hunting land without detriment to the stock and to collect from 400,000 to 1,500,000 partridges for domestic consumption and export. The density of these valuable birds in Britain averages 312 birds per 1,000 ha. and rises to 1250 in the best lands.

As may be seen from these examples, the gray partridge can exist

handsomely under agricultural conditions, even in such densely populated countries as Czechoslovakia and Britain. The sharp drop in its numerical strength in the USSR is due primarily to the tilling of large steppe areas and the destruction of forest and brush areas. Equally fatal is the grazing of cattle in the few surviving steppe birch groves and the clearing of bushes from natural hayfields and pasture lands. The latter measure, which is being carried out at present on a very wide scale, has a grave effect upon the stock of a number of species of game birds (gray partridge, black grouse, certain ducks, the woodcock and others). Bushes in meadows are indispensable to them as nesting places and concealment for their broods. From those lands that are entirely cleared of bushes, the gray partridge also disappears entirely. It must be noted that this measure is not always rational from the economic viewpoint and should be taken only with strict regard for local conditions. Willow growths in floodplains along the river channel play the role of a sort of filter contributing to the settling of fertile alluvium. Their destruction results in the washing out of the floodplain. Bushes in meadows insure the accumulation of snow, so that in the steppe regions the best grass stands are observed precisely around bushes. The best alternative, combining the interests of hunting with the raising of the productivity of meadows, should be the preservation of parallel strips of bushes on meadows and the planting of meadows in case they are lacking.

A positive role in the preservation of the stock of gray partridge is played by the shelter belts, in the vicinity of which the density of these birds is always higher.

Among the crops that have replaced the natural steppe, the partridge settles with special fondness and in the greatest density in fields of potatoes and sugar beets. Lately, reports have come from many points about the perishing of gray partridge, black grouse and pheasant as a result of being poisoned by grain treated with granozan and by mineral fertilizers applied to the fields. Partridge often perish in large numbers after severe winters. In the northern part of their distribution area this occurs with a deep and long-lasting snow cover and in the south in case of glaze frosts. In these periods the partridge needs man's aid in the form of additional food and the erection of artificial shelters. Finally, in order to preserve and restore the numerical strength of the gray partridge there is a need for a complete hunting prohibition, a resolute struggle against poaching and, in European Russia, artificial breeding.

Pheasant and quail. The reserves of still two other valuable species of game birds, pheasant and quail, are being sharply reduced. The drop in the number of the former is due to the cutting of the floodplain forests and the clearing of bush growths in the foothill and semidesert regions of the south of the Soviet Union, as well as the spring burning of dry grass practiced in a number of regions. In order to increase the stock of pheasant it is necessary to preserve sections of bush growths in the regions populated by this species and to create new stands of proper density and dimensions. The diminution in the quantity of quail in the steppe belt of the European

part of the USSR must be explained primarily by the mass destruction of quail in the countries of the Mediterranean, where the birds spend the winter. Quail are hunted professionally in Italy, Algeria and Egypt. Not long ago 400,000 to 800,000 European quail were still being exported to Europe from Alexandria. The restoration of the number of this species can be promoted by the conclusion of an international convention on the restriction of the hunting of quail in wintertime.

Great and little bustard. Still more unfavorable is the state of the reserves of the steppe wildfowl, the great and little bustard. This phenomenon is to be expected because the areas of the habitat of both species are contracting as the virgin steppes are plowed up. Especially grave is the effect of the process of economic development of the steppes upon the stock of the little bustard. At the end of the 18th century it was still a common nesting bird in Belorussia and the forest-steppe regions of Orel, Kursk and Tambov guberniyas (Kirikov, 1959). Around 1850 flocks of thousands of little bustard were encountered in the fall in Voronezh gub. (Severtsov, 1853). But already in 1920-30 the boundary of its habitat ran along the southern margin of the European forest-steppe. At present in the European part of the Union the litttle bustard maintains itself for the nesting season only in a few isolated regions. There has also been a serious drop in its number in Kazakhstan since the development of the virgin and idle lands. There are for the time being no grounds for counting upon the restoration of the former area of this valuable species, but to preserve and enlarge the stock it is necessary to discontinue hunting entirely, to carry on a strict campaign against poaching and to create a network of bird sanctuaries.

The great bustard, unlike the little bustard, reacts less to the tilling of the steppe. It does not shun tracts of plowland and likes to nest in winter-crop fields. Nevertheless, its area has decreased almost as much. In this case the main role has been played by direct extermination by man. In recent years this process has been speeded by the development of motor transportation. The numerical strength of the great bustard in the European steppe has dropped to a minimum. Its reserves are also threatened in Siberia and Kazakhstan. The stock of this exceptionally valuable bird can be restored and it can again appear in places from which it has entirely disappeared, provided hunting is discontinued everywhere and poaching is stamped out.

Waterfowl. It is much more complicated to establish and eliminate the causes of the sharp reduction in the reserves of waterfowl. The birds of this group belong to the migratory category, spend various seasons of the year in regions distant from one another and fly annually beyond the borders of the Soviet Union. The bean goose, which nest in the tundra of central Siberia, spend the winter in the north of Western Europe; the snow geese fly from Vrangel' Island to the Pacific coast of the United States, and ducks from the lower courses of the Ob' and Irtysh spend the moulting period in the Volga delta and then fly to Transcaucasia, the Balkans and Egypt for the winter. Hence, the influence of the natural geographic conditions,

the economic activity of society or simply the mass extermination of birds in any region asserts itself upon their numerical strength in other territories, sometimes very distant.

To characterize the economic significance of waterfowl and to estimate the state of their reserves is still more difficult than for wood game. Game collections have been organized for only a few years and have embraced very limited territories, so that even in these years only a negligible portion of the whole catch made by hunters has reached the collecting points. In 1931 only 5,500,000 ducks, geese, swans and coots were collected. Nearly a half of this number of birds (2,464,000) were caught in Western Siberia, mainly in the lake forest-steppe. In the same zone of the Trans-Urals 1,240,000 more birds were collected, and 285,000 in Kazakhstan. The remaining territories rich in waterfowl yielded almost no produce.

In the Ukraine about 203,000 birds were collected, in Karelia 37,000 and in the former Severnyy (Northern) Kray only 23,000. However, on the basis of these figures one cannot gain any proper notion regarding the total number of waterfowl caught each year. It suffices to state that in Azerbaydzhan alone in the years before the Great Patriotic War (World War II) hunters annually caught 700,000 to 750,000 birds. Hundreds of thousands of ducks are caught in Central Asia and in the Far East, and especially many in the north of Siberia. Ducks are everywhere the main quarry of amateur hunters, wherever they live. It may be assumed that altogether throughout the Union more waterfowl than wood game are caught.

The reserves of waterfowl in the Soviet Union are declining perceptibly and incessantly over the whole territory. Especially rapid is the diminution of the numerical strength of the birds during the last 25 to 30 years. The causes are many, both general and local. The former include: the growing number of hunters, the persisting practice of poaching, and the gathering of eggs. Recently to be added to this category is the sharp deterioration in the wintering conditions and the perishing of birds in the winter period.

The vast swampy lowlands on which our ducks and geese have found refuge in the wintertime during the last 30 years are gradually being drained and their lands used for agriculture. This has been true of the main wintering regions of birds in the USSR, the Colchis and the Kura-Aras Plain, on which millions of ducks, geese and coots congregate in the wintertime. At the beginning of the 20th century the Azerbaydzhan wintering places still occupied a total area of more than 1,000,000 ha. and provided normal living conditions for a large number of birds. The drop in the level of the Caspian Sea, the reclamation of the Mugan' Steppe, the draining of the Lenkoran' Lowland and the change from rice to tea growing have had the result that the territory suitable for the wintering of birds has been reduced by at least ten times. The second most important wintering place, the shallow Gasan-Kuli Gulf, was reduced from 1,030,000 ha. in 1888 to 20,000 ha. in 1932, and has now almost completely dried up.

The size of the territories serving as wintering places for migratory birds abroad is shrinking incessantly. The swampy lowlands of Lincolnshire in Britain have already been covered with orchards and vegetable gardens; the Zuider Zee gulf in the Netherlands is being drained, as are also the valley of the Po River and the Venetian Lagoon in Italy; irrigation works are being carried forward in the Enzeli Lowland (Iran), in the valley of the Euphrates (Iraq), the delta of the Nile (Egypt) and in other regions. As a result of the changes that have occurred, the migratory birds are forced to concentrate in the few surviving wintering regions, which are very limited in area. On the feeding grounds of Kizyl-Agach Gulf, as many as 850 ducks, or 50 to 90 coots, assemble per hectare at one time. The capacity of these grounds cannot provide for such large accumulation of birds. The food resources are rapidly being exhausted, which forces the birds to fly farther south in search of suitable bodies of water . This circumstance has a fatal effect upon the numerical strength of game birds and requires an urgent solution, both by biotechnical work on Soviet wintering grounds and through international negotiations concerning conservation abroad.

Still more limited in area are the grounds on which waterfowl spend the moulting period. As a result of the drop in the level of the Caspian, moulting birds have already disappeared from the delta of the Ural River and the Mertvyy Kultuk Bay. They are threatened on the Sarpa Lakes, as well as on certain lakes of the Siberian forest-steppe.

In the nesting period waterfowl settle in the whole territory of the USSR, but their habitat conditions, and accordingly also the state of their reserves, differ in various zones. In the deserts and semi-deserts the nesting regions of ducks and geese are confined to the valleys of the big rivers and are widely separated from one another. The number of nesting birds is considerable in some places (floodplain of the Sary-Su, lower course of the Syr-Dar'ya), but it has been greatly reduced in recent years as a result of the settling of these territories by man, the development of fishing and the practice of burning reeds. The causes of the reduction in the number of wildfowl can be eliminated by simple administrative measures. At the same time, new bodies of water have arisen in the deserts: the great reservoirs on the Zeravshan River, the Kelif Lakes and others, which have become nesting regions for a considerable number of birds.

In the steppe and forest-steppe waterfowl inhabit the river floodplains, but the reserves are especially large on the vast lake plains. The European part of the USSR had large numbers of ducks and geese until recently. This is evidenced by the circumstance that decoy trapping of birds was practiced on many steppe rivers (Don, Psel, Dema and others). The valleys of the steppe streams were rich in growths of reed and floodplain oak groves. As the population grew, the river valleys were exploited by agriculture and now few places suitable for the settlement of ducks have survived. The reserves of birds in this territory are negligible and it is possible to restore them only by creating a network of bird refuges. These sanctuaries, in addition to protection, must be concerned with conversion of surviving bodies of water to a state suitable for ducks and geese.

On the Asiatic territory of the USSR waterfowl congregate especially in the lake regions of Kazakhstan, the Trans-Urals and the Baraba. It is this vast territory that yields the largest number of ducks, geese, and coots, as shown by the above-cited figures on collections. However, this production varies greatly over the years owing to sharp fluctuations in the level of the lakes which are due to climatic causes. The present state of this nesting region is fairly favorable, but the contemplated work on the reclamation of the northern part of the Baraba may considerably reduce its productivity.

It is very difficult to estimate the total reserves of waterfowl in the forest belt, since ducks nest over the whole territory, forming large concentrations only in the valleys of the big rivers. In the European part of the Union the reserves are now small, and only in a few regions (in the north) do they reach professional-hunting density. The floodplains of the big rivers in this territory have been settled and developed, so that few places suitable for aquatic birds remain. Radical changes in the whole natural complex are being caused by the construction of reservoirs. In the first stages of their existence, the appearance of these water bodies contribute to the growth in the stock of certain species of waterfowl (mallard), but at the same time it causes a sharp reduction in the numerical strength of a number of others (the garganey, the shoveler, the coot). Soon the valleys of certain rivers (Volga, Dnieper, Kama and others) will represent an unbroken chain of reservoirs; hence it is necessary to make the correct use of these bodies of water for hunting purposes. For this, there should be organized on each one of them a bird refuge having the duty of carrying out the necessary biotechnical measures, primarily hydrotechnical, to provide for the maintenance of a constant level in the bodies of water (the inlets of the reservoir) set aside for hunting.

In the tayga belt of Siberia the reserves of waterfowl are much larger and are not in such a threatened position as in Europe. However, even there one clearly notes a continuous reduction in the stock of local and migratory wildfowl. The causes lie in the rapid settlement of the tayga (especially along the river valleys), the increase in the number of hunters, as well as in the deterioriation of the moulting and wintering conditions for the local birds.

The tundra and forest-tundra possess large reserves of waterfowl. It may be assumed that in total production these zones are even richer than the lake forest-steppe. In addition to the large number of ducks, it is here that the main mass of our geese nest, numbering more than six species. Their abundance may be characterized by the fact that until recently as many as 20,000 geese were caught in the moulting season on Kolguyev Island alone. However, even in this zone, which has been least touched by man's economic activity, the reserves of wildfowl are declining very sharply in some places. Thus, for example, the stock of brant geese has declined ten times in the last 50 years (Uspenskiy, 1959). This phenomenon may be explained by two main causes: the immoderate trapping of moulting geese in the north and the intensive professional hunting of waterfowl in the Western European and

North American wintering grounds. The latter is confirmed by the large figures on the trapping of ducks with decoy traps in Britain (Gilbert et al., 1941) and the catching of brant geese in Jutland (Solomonsen, 1959), where a considerable quantity of our birds winter.

With regard to the brant, the dying of its main food plant, the eelgrass, over extensive areas, also has substantial significance. Finally, during recent years great significance has been acquired by still another factor causing the mass death of birds: the pollution of the sea with petroleum. A considerable part of the diving ducks inhabiting the tundra winter in the Baltic and North Seas, many parts of which are regularly polluted with petroleum products. For example, in January, 1957, more than 30,000 old squaws perished near Gotland, having landed in an oil slick, after which these ducks disappeared almost entirely from Swedish Lappland. Oil pollution of the waters has undergone wide distribution; it appears in many seas and rivers. The death of waterfowl from this cause has been noted along the Murmansk (Kuznetsov, 1949) and Kamchatka coasts (Averin, 1949). In Azerbaydzhan 20,000 to 25,000 birds perish annually from oil pollution (Vereshchagin, 1946). Legislative measures are indispensable to avert further pollution of water bodies.

Birds of the northern seacoasts. A few words remain to be said about the resources in sea birds inhabiting the coasts of the Arctic seas. Of very great value is the eider duck, furnishing an excellent down worth more than 200 rubles a kilogram. The collection of eiderdown was at one time one of the profitable occupations of the local population. However, the hunting of the eider duck and the gathering of its eggs resulted in a rapid reduction of their numbers. The reserves of this valuable species have been greatly undermined at places (the Murmansk and Karelian coast of the White Sea), but elsewhere (Novaya Zemlya) they are still considerable. To restore the eider reserves it is necessary to protect them strictly and to carry out a number of simple biotechnical measures.

A large role in the life of the population of the extreme north is played by colony-forming birds, nesting in "bird bazaars", primarily the murre. They yield a large number of eggs, exceeding chicken eggs in fat and vitamin content. The significance of murre eggs as a food product, under the difficult conditions of the Arctic, is exceptionally great. The murre reserves are considerable. Novaya Zemlya alone has about 2,000,000, and 28 colonies with a total of 1,500,000 birds are available for exploitation in the next few years (Uspenskiy, 1956).

The analysis of the present and past state of game animals has rather clearly defined certain measures that need to be taken to restore and multiply the reserves of these animals.

Especially important and indispensable (in addition to those pointed out

in the analysis of individual species) are the following:

1. In addition to natural preserves, it is urgently necessary to create a network of large refuges for game animals. Experience in the United States, where (according to 1949 data) about ten million hectares have been declared wildlife refuges, has shown that such refuges have a great effect in conserving and enlarging the reserves of game animals (Deparma, 1957).

The national refuges, in addition to protecting the animals, should make great efforts to improve the habitat of wildlife and propagate the animals.

2. No economy, including that of hunting, can exist without taking account of the resources and realizable produce. Hence, it is necessary to organize the inventory-taking of game and birds (as is being done in the United States, Canada, Britain and Czechoslovakia). It is necessary to take stock of the most valuable species, record their distribution on the map and then inventory changes in numbers.

At the same time it is necessary to organize a complete inventory of the whole produce taken by hunters, not only the part delivered to the collecting bases but also that used for personal consumption. Only on the basis of these data will it be possible to judge the extent of under-hunting or over-hunting in various regions. This work can be performed only by the joint efforts of a number of institutions and departments, under the general guidance of the Academy of Sciences of the USSR.

3. The present system of professional hunting does not embrace evenly the main game animals and hunting grounds. On the Bol'shezemel'skaya and Malozemel'skaya Tundras, for example, about 40% of the hunting grounds are not used at all; only the grounds situated in a 30-40-kilometer strip along the coasts of the Kara and Barents Seas are being intensively exploited; the central parts of the tundras remain almost unused (Skrobov, 1956). The same thing, but on a still greater scale, is observed in the Siberian tayga. At the same time there is a sharp decline of the reserves of many game species in the central oblasts of the European part of the USSR. The localities situated around cities and industrial centers are, as a rule, being completely devastated. Hence, it is necessary to create wildlife refuges around the big cities, where hunting should not be permitted except under license, issued in cases where the threat of overpopulation by certain species (elk, for example) arises.

On the other hand, it is necessary to create transportation and supply conditions to promote hunting in remote tayga and tundra areas. This is especially necessary for those places where epizootics have begun to appear because of a great density of animals.

4. A number of measures must be carried out to protect and improve the hunting grounds. The system of continuous cuttings of forest over extensive areas, resulting in the creation of monoculture stands of the same age(mainly pine),

is unfavorable to the hunting economy. It is desirable (especially in regions rich in wood game) to apply various methods of selective logging to insure the creation of stands of different species and ages. In particular, it is necessary to preserve wooded areas occupied by the mating places of capercaillie and black grouse. In order to conserve the stock of partridge, pheasant and certain other species it is quite indispensable to preserve copses and stands of bushes. This requirement should be combined with the interests of steppe forest propagation. It must be categorically forbidden to burn off riverside vegetation and reed growths. A hem of virgin land (100 to 200 meters wide) should be left around birch groves in the steppe and forest-steppe, and the grazing of cattle in them should be prohibited.

As a result of the tilling of the floodplains and the draining of the swampy lowlands, the grounds providing nesting places for waterfowl are disappearing from large areas, especially in the European part of the USSR. Because of this, the game-bird reserves are being seriously reduced in a number of oblasts. They are in an especially grave situation in the moulting and wintering periods. It is necessary to take an inventory and establish strict protection of all the grounds used by birds in these seasons. At the same time, it is necessary to carry out extensive work in the improvement of the food and shelter conditions for this group of birds in their main nesting and wintering regions in the USSR, as well as to arrive at international agreements on the protection of our birds that spend the winter abroad.

5. Poaching has assumed the proportions of a national calamity in our country. A more energetic and resolute campaign against it is therefore necessary. The local authorities (rayon soviets, rural soviets, etc.) and the police must take a bigger part in the struggle against poaching. In particular, hunting from motor vehicles and motor boats must be prohibited, as well as the nocturnal extermination of animals by means of the blinding effect of light. In addition to the usual punishment for such poachers, the motor vehicles or motor boats should be confiscated.

In spring, during the formation of frozen snow crust and in winters with much snow the local community and local authorities must see to it that hoofed animals are not subjected to reckless extermination.

6. The extent of the catch of hoofed animals must be regulated by law. It is necessary to institute a complete prohibition against hunting the partridge, the great and little bustard, and the swan in European Russia, as well as the gray-lag goose and the capercaillie in the central oblasts.

7. It is necessary to prohibit the grazing of mangy domestic animals and animals with other infectious diseases on pasture lands where wild hoofed animals graze.

8. In the field of science the following measures must be noted as having first priority:

The All-Union Scientific-Institute for Animal Raw Materials and Furs (situated in Kirov) does not concern itself with questions of biology, the distribution or the state of the reserves of hoofed animals and game birds. Hence, it is necessary to create a scientific-research institute that will engage in the study of these questions with respect to all game animals and not solely with questions of biology and the distribution and rationalization of the hunting of fur-bearing animals.

Furthermore, it is necessary that the problem of the conservation and renewal of the reserves of game animals be included in the plans of other scientific-research institutions as well (the Zoological Institutes of the Academy of Sciences of the USSR, and of its branches and Union academies, the Institute of Geography of the Academy of Sciences of the USSR, the zoology departments of universities and agricultural institutes). To keep a check on the numerical strength of game animals it is necessary to create permanent observation points in various areas. Annual inventories must be taken both of the game animals and of other species upon which the distribution and numerical strength of game animals depends. No less indispensable are investigations studying the epizootics of game animals.

NEWS NOTES

By Theodore Shabad

Expansion of Moscow City Limits. By a decree of August 18, 1960, the city limits of Moscow have been expanded, more than doubling the city area, and a large green belt around the city has been placed under the jurisdiction of the Moscow city government. The city limits have been expanded to the belt highway under construction around Moscow. The annexed area contains the suburban cities of Babushkin, Kuntsevo, Lyublino, Perovo and Tushino. The city area has increased from 35,637 ha to 87,500 ha. The population figure for the expanded area is estimated at 6,046,000 (the population of Moscow before expansion was 5,046,000 according to the 1959 census).

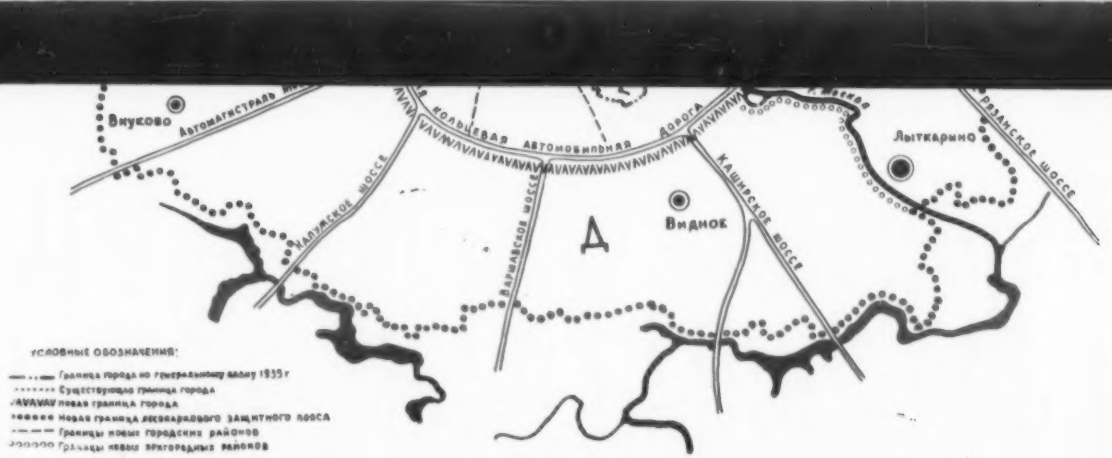
Instead of the previous 20 city rayons (boroughs), the new Moscow will be divided into 17 rayons, of which four (Sverdlov, Bauman, Kirov and Frunze) will be situated within the inner city bounded by the Sadovaya Ring.

The green belt around Moscow has an area of 180,000 ha and a population of 931,000. It is divided into five suburban rayons: Balashikha, Krasnogorsk, Lyubertsy, Mytishchi and Ul'yanovskiy (see map on Pages 91-92). These green-belt rayons contain the cities of Mytishchi, Balashikha, Lyubertsy, Vnukovo, Reutov, Lytkarino, Odintsovo, Krasnogorsk, Khimki, Vidnoye and Dolgoprudnyy. In addition the green belt contains eleven state farms and fourteen collective farms.

Boksitogorsk Alumina Plant Conversion Planned. An article by P. Antropov, Soviet Geology Minister, in Pravda, May 15, 1960, discloses that a plan for the conversion of the Boksitogorsk alumina plant to the nephelite process has won the support of the Council of Technical and Economic Experts of Gosplan USSR. The Boksitogorsk plant has been using local low-grade bauxite for alumina production. The nephelite conversion plan was originally rejected by the Leningrad Regional Economic Council on the basis of findings of Giproalyuminiy and Giprotsement, the Soviet aluminum and cement designing organizations.

Expansion of Kohtla-Järve City in Estonia. The city limits of Kohtla-Järve, Estonian oil-shale center, have been expanded to include the entire mining area within the city limits. The mining towns of Johvi, Ahtme and Sompa have been incorporated within the city limits of Kohtla-Järve, and the mining towns of Kivioli, Püssi and Viivikonna as well as the surrounding rural area have been placed under the jurisdiction of the Kohtla-Järve city government (Sovetskaya Estoniya, October 15, 1960).

А
Б
В
Г
Ленинградское шоссе
Дмитровское шоссе
Ярославское шоссе
Щелковское шоссе
Балашиха
Горьковское шоссе
Ногинское шоссе
Рязанское шоссе
Красногорск
Химки
Долгопрудный
Мытищи
Ивантеевка
Ногинск
Реутов
Люберцы
Одинцово
Кунцево
Перово
Лосиноостровская
Лосиный
Измайлово
Кусково
Кожухово
Кунцевская
Можайское шоссе
Минское шоссе
Автомагистраль Москва - Минск



Legend: City limits according to 1935 urban expansion plan (not implemented)
Present city limits
New city limits (after expansion)
Outer limits of green belt
Boundaries of new city rayons
Boundaries of new suburban rayons (in green belt)

City Rayons

1. Sverdlov
2. Bauman
3. Kirov
4. Frunze
5. Lenin
6. Kiev
7. Krasnaya Presnya
8. Leningrad
9. Timiryazev
10. Dzerzhinskiy
11. Kuybyshev
12. Stalin
13. Kalinin
14. Zhdanov
15. Proletarskiy
16. Moskvoretskiy
17. Oktyabr'skiy

Green-Belt Rayons

A-Krasnogorsk B-Mytishchi V-Balashikha G-Lyubertsy D-Ul'yanovskiy

CURRENT LITERATURE

Izvestiya Akademii Nauk SSSR, seriya geograficheskaya,
July-August 1960

The deep reaches of the ocean and the problem of radioactive waste disposal -- V. G. Bogorov and B. A. Tareyev 3

Morphostructural characteristics of the relief of the Siberian platform and neotectonics -- S. S. Korzhuyev 11

Holocene levels of the Caspian and Black Sea basins -- P. V. Fedorov and L. A. Skiba 24

Lenin's ideas on Socialist economic regionalization and their realization -- P. M. Alampiyev 35

Problems of the development of the productive forces of the Soviet Baltic republics -- M. I. Rostovtsev 44

Shifts in the distribution of industry of the Irkutsk economic administrative region -- A. A. Grigor'yeva 56

Conditions in the area of Pionerskaya station at the southern edge of catabatic winds in the Antarctic -- V. M. Kotlyakov 63

Mummified seals and penguins found in the Antarctic -- K.K.Markov 72

The principal stages in the evolution of the relief of the plains section of the eastern Caucasus foreland -- G. I. Rychagov and O. K. Leont'yev 75

A new concept of the orography of the Transbaykal area -- N. F. Leont'yev, L. I. Mukhina, V. N. Olyunin, V. S. Preobrazhenskiy and N. V. Fadeyeva 82

Deep-lying perennial frozen rocks in Western Siberia -- A.A.Zemtsov 89

Runoff of rain and snow-melt waters on the slopes of the Terskey Ala-Tau range -- M. I. Iveronova 93

The mechanics of the windbreaking effect of various types of shelter belts -- Ya. A. Smal'ko 99

A Paris collection of Russian maps dating from the first half of the 18th century (collection of Academician I. N. Delile) -- K. A. Salishchev 104

Geomorphic and hydrologic studies on Engure Lake (Latvian SSR) in the middle of the 18th century and their importance for research on shore development of lakes and reservoirs -- S. L. Vendrov 111

Study of the snow-melting process by means of radioactive isotopes -- Yu. N. Agashkin 117

Recent studies in the Quaternary paleogeography of Sweden -- M. I. Neyshtadt 122

An atlas of Sweden -- L. R. Serebryannyy 125

Toponymics in the Polish People's Republic -- E. M. Murzayev 129

Atlas Mira (1959) -- Reviewed by A. N. Larionova (This is the fourth atlas published with that title since 1954 -- Editor, S.G.) 132

Publications of the Chernovtsy economic geographers -- Reviewed by F. N. Sukhopara, V. A. Vityazeva and A. I. Prokhorov 133

A new study on agricultural mapping -- Reviewed by I. A. Borodin and N. F. Leont'yev 135
A meeting of the interdepartmental commission on aerial surveys (Leningrad, December 1959) -- D. M. Kudritskiy 138
An anniversary conference of the Black Sea experimental research station of the Institute of Oceanology of the Academy of Sciences (Gelendzhik, March 1960) -- N. A. Aybulatov and V. P. Nikolayev 139
A conference on problems of the general air circulation in the atmosphere (March 1960) -- K. V. Kuvshinova 142
A conference on problems of neotectonics in the Baltic region (Tallinn, March 1960) -- B. N. Mozhayev 146
Election of Academician I. P. Gerasimov as honorary member of the Italian Geographical Society (March 1960) 149
A French geographer, Jean Dresch, visits the Soviet Union (April 1960) -- V. A. Nikolayev 149
A Hungarian geographer's impressions of the Third Congress of the Geographical Society of the USSR -- Sandor Rado 151

Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva
July-August 1960

The active method of studying the central Arctic (A brief survey of the work of Soviet ice-floe stations) -- P. A. Gordiyenko 293
New Russian data on the voyage of the Vega around Europe and Asia -- M. I. Belov 308
Scientific studies of the Chelyuskin expedition -- S. D. Lappo 322
The physical-geographic regions of Africa -- S.M. Lukoyanov 332
The so-called typological concept of landscape -- A.G.Isachenko 339
The problem of economic regionalization -- Stanislaw Leszczycki 346
The limits of vegetation belts in the mountains of Sakhalin and their environmental factors -- V. D. Lopatin 349
The causes of a peculiar state of the ice cover in one of the areas of the Arctic Ocean (observations of 1956) -- V.S. Antonov 353
Agricultural measures and their influence on water-supply changes in the ponds of the Saratov trans-Volga area -- G.V. Nazarov 357
Once more about the boundary between Europe and Asia in connection with the definition of large physical-geographic areal units -- V. I. Prokayev 361
Fluctuations of the Kash-Tash glacier -- A. S. Zyuzin 365
Reviews:
A. V. Darinskiy. Metodika prepodavaniya geografii (Methods of Geography Teaching) -- reviewed by N.M. Borozdinov 370
Climate of Japan -- reviewed by A. Kurashima and S. Mizuno 371
Preparations for the publication of the Trudy GOELRO (Proceedings of the State Commission for the Electrification of Russia)-- A. V. Sokolov 376
New data on the biography of I.D.Cherskiy, Russian explorer of Siberia -- S. F. Koval' 377

Vestnik Moskovskogo Universiteta: seriya geografiya
May-June 1960

V. I. Lenin and the electrification of the USSR -- P.N. Stepanov 3
The average elevation of the Antarctic -- K. K. Markov 7
An analysis of the structure of steppe and semi-desert landscapes by means of aerial photography -- V. A. Nikolayev 15
Phenomena of Upper Pliocene peneplanation in the mountains of Dagestan -- A. Ye. Krivolutskiy 22
Geological maps in national atlases -- N. V. Krasil'nikova 30
Vertical water circulation in winter in zones under the influence of shore runoff -- K. D. Sabinin 37
Integrated economic-geographic studies in eastern Kazakhstan -- S. P. Ivanov, V. P. Korovitsyn, I. V. Nikol'skiy and A. T. Khrushchev 42
Glacial-marine sediments in northern Eurasia -- G. I. Lazukov 48
Gully erosion in Siberia -- B. F. Kosov 54
A year in Yünnan (biogeography notes) -- A. G. Voronov 60
Environmentalism and possibilism -- Yu. G. Saushkin 67
The existence of an outlet of the Uzboy through the Adzhaib -- L. G. Nikiforov 69
Dwarf spruce thickets in the shelter of a snow cornice- N. N. Karpov 71
The dual reverse asymmetric form of some ravines of the Stalingrad trans-Volga area -- V. A. Nikolayev 72
A new science -- antropogeology -- A. Ye. Krivolutskiy 73
The first national conference on land inventory and evaluation (March 1960) -- K. V. Zvorykin 74
Reviews:
L. A. Knyazhinskaya. Zapadnaya Indiya (Western India)-- Reviewed by A. M. Ryabchikov 75
I. S. Shchukin and O. Ye. Shchukina. Zhizn' gor (The Life of Mountains) -- Reviewed by A. A. Vidina 76
S. V. Kirikov. Faunal changes in the natural zones of the USSR Izmeneniye zhivotnogo mira v prirodnykh zonakh SSSR (Faunal Changes in the Natural Zones of the USSR)-- Reviewed by G. N. Annenskaya 76
V. S. Preobrazhenskiy. Ocherki prirody Donetskogo kryazha (Essays on the Physical Geography of the Donets Ridge)-- Reviewed by M. G. Bozhko 77
Bibliography of geographical literature published in the second half of 1959 78